40 Rock (C)

POPULAR Computing WEEKLY

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This Week

News Desk

Wind-down for the Model A

ACORN computers has decided to discontinue the BBC Model A machine

Production is currently being wound down and a spokesman commented "The reason is that nearly all of the orders now are for the BBC Model B and those who do buy As are tending to upgrade to Bs very quickly "

Acorn denies that the decision has been taken because the now-imminent Electron machine will supersede the Model A "Although it looks like that it is purely coincidental," he said "It happens that people who buy the BBC seem to want the greater power of the B If demand had been the other way around it would be the Model B that we would be stopping instead

The Electron, on the other hand will tend to be attractive to people still on Sinclair-type machines," he added

The price of the Electron has now been fixed at £199 The BBC Model B remains at £399

Electric car project rolls on

IT now seems likely that the electric car being developed by Sir Clive Sinclair will be a three-wheeler, powered by a new electric motor using a conventional lead-acid battery design

The Sinclair Vehicle Project, as it is called, has been active for over ten years and the electric car is now planned for sale in 1985 Although research on the project began in 1973 the major development work began in 1981 following the formation of Sinclair Research Early this year a share placement for Sinclair Research raised £12 9m for the work and the vehicle project was split off as a separate venture owned by Sir Clive

The SVP group is now based in Exeter under the guidance of Barrie Wills

The group is also exploring the potential of an electrically assisted bicycle Forthcoming government legislation may allow such a bike to be ridden by 14 year olds

Continued on page 40

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Popular Computing Weekly cannot accept any responsibility for any errors in programs we publish although we will always try our best to make sure programs work

This Week

Editorial

The electric car has long been dreamed of by motor companies and environmentalists alike Such a car would be non-polluting, economic and, above all, cheap

Companies such as Ford, General Motors and the Japanese conglomerates have commissioned design studies, built prototypes and tested a dozen different models However, none of them have produced a vehicle that is commercially viable

Now, Sinclair, with his acquisition of an option to purchase the defunct De Lorean car plant has publicly thrown his hat into the ring This is not, however, a sudden move on Sinclair's part He has been working on the project since at least 1973 and had probably been formulating ideas long before that

An electric car would certainly be a considerable coup for Sinclair, since he would be succeeding where many have already failed But, there are a number of technical problems still to be overcome before the Sinclair-mobile takes to the road

Most conventional lead/acid or nickel/cadmium batteries are too heavy in relation to their output to make a suitable power source They also need to be recharged frequently

If Sinclair has come up with a new type of battery, or a method of making existing batteries more efficient, the world's first mass-produced electric car may yet have a ZX logo

Next Thursday

Next week's Star Game is Mini Pacman by Richard Walton — it's for the super expanded Vic20 but can be easily adjusted for the unexpanded Vic.

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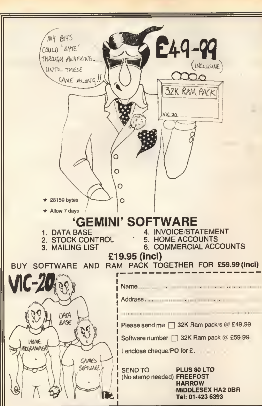
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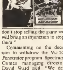
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Double trouble for Spectrum games

SPECTRUM Games has been forced to withdraw its *Penetrator* program for the Vic20

The decision follows discussions with Melbourne House who market a program with the same title for the ZX Spectrum

Melbourne House threatened legal proceedings against Spectrum Games if the Vic20 program continued to be sold Melbourne's Christine Laugharne said "There is a law about passing-off If they don't stop selling the game we will bring an injunction to stop them "



Managing director David Ward

Commenting on the decision to withdraw the Vic 20 *Penetrator* program Spectrum Games managing director David Ward said "We decided that it was better to do so to avoid any confusion between the two games "

Manchester-based Spectrum Games has produced a range of arcade titles for the Spectrum and Vic machines.

Lynx shares offer

IF you ever hankered after becoming a high-technology investor now is your chance

A new company Camputers Holdings plc has been set up by Camputers manufacturers of the Lynx Microcomputer Some 25 per cent of the company's share capital is being offered for sale

Up to 6,400,000 ordinary 10p shares are available at 17p a share and the sale will raise about £900 000 to fund further expansion and development work necessary in the coming year The shares offer is open to any individual Although Camputers is keen to encourage small investors, a minimum purchase of 3 000 shares (£510) is suggested

For those who wish to know about such things, stockbrokers Statham Duff Stoop are handling the share placement The directors of Camputers forecast a profit before tax of around £750,000 for the year ending March 31, 1983, and the shares have a prospective fully taxed profit/earning value of 12 0 In due course, Camputers Holding plc will seek a full stock market quotation Until then shares will change hands through the brokers on a matched-market basis

Statham Duff Stoop are on 01-628 5070

Texas second victim of vicious US war

TEXAS Instruments has followed Atari to become the second victim of the vicious US price-cutting war

Following the forecast of a $100m loss for the second quarter of this year — leaked to the *Dallas Financial Times* on Friday June 10 — TI's share price plunged 51 points in two days This wiped out nearly $1bn in equity and was one of the sharpest market declines in recent American history

Texas' loss comes mainly from the home computer division, where the April price drop of the TI99/4A by $50 to only $100 spectacularly failed to produce an upturn in sales

The company showed only one new product at the recent Chicago trade show — a re-vamped 99/4A in a different case, designed to reduce losses on the product

Of the big three US manufacturers only Commodore remains comparatively unaffected — following Atari's dismal recent financial results Commodore's share price suffered following Texas' bombshell, but the company has just announced results for the quarter ending March 31 up to 124 percent to $25m

Commodore is now selling the 64 machine for only $199 in the US and offering a staggering further $100 rebate off the price in exchange for a used Vic20

Commodore International's chief, Jack Tramiel, in town for the Earls Court show, denied that the price war in the US had now gone too far "Not at all It is all to do with the learning curve — as we improve our yield and manufacturing efficiency we can reduce prices We do not wait until we are forced to cut prices — we do it when we can "

● THE price of the Commodore 64 machine will fall to £229 from August 1

But, retailers are expected to discount this price still further to bring it down under the £200 barrier

Bug-Byte on the move!



LIVERPOOL based software house Bug Byte has moved to new offices in the city

The 6 000 sq ft office complex at Mulberry House Canning Place cost £50 000 to fit out to Bug-Byte's specifications Work was completed in early June

This move concentrates Bug-Byte's activities under one roof Spool Ltd, which is half owned by Bug-Byte, is a new tape duplicating company that is also located in Mulberry House

Using a Gauss half-inch loop-bin system Spool duplicates tapes at 16 times normal speed Director Roy Varley plans to build up capacity to 25,000 tapes a week by the beginning of August

Bug Byte, which was founded in the spring of 1980 by Tony Baden and Tony Milner, is also planning an export drive Sales Manager John Phillips is hoping to establish new markets in the US Europe Australia and New Zealand

Spriteful system for the Dragon

PREMIER Micro Systems has developed a graphics system for the Dragon computer

The hardware/software combinations takes the form of a cartridge which plugs into the Rom port on the Dragon Using a combination of the TI99/26 video chip and 16K additional video Ram the graphics card gives the Dragon a high resolution 192 x 256 display in 16 colours and a 32 sprite (movable graphics shapes) capability

Sprites up to 36 x 36 pixels (4 x 4 characters) in size can be defined using Basic commands which take the form of an extension to the existing Microsoft Basic

Premier also plan a motherboard card rack and six-voice sound card for the machine

The graphics system should be available in September for under £100 Details from Premier Micro Systems, 208 Croydon Road, Anerley London.

LETTERS

Invidia dragonis . . . 1

My thanks to James Thomas for his exaggerated but amusing diagnosis (2-8 June)

For the record, I am not envious of the Dragon's switches and keyboard The Spectrum's rubber keys may be squidgy but, because of the computer's one word entry system and comprehensive syntax checking it is far easier to type and run a program on the Spectrum than it is on the Dragon with its almost illegible black on green screen

Neither am I jealous of the other six items in Mr (or should I say Dr?) Thomas's list including the Dragon's superfluous sockets and modes — the highest resolution is no higher than that of the Spectrum As for expansion capabilities you may have noticed that the Spectrum but not the Dragon, has pages on Prestel's Micronet database

A friend of mine had a Dragon but sold it to buy an Oric which proves that often in the world of micros paying less buys you more

Anyway, most Spectrum owners are content in the knowledge that their micros have lower-case letters, user defined graphics, the ability to mix hi-res graphics with text and to change the colour of text All these facilities are non-existent on the Dragon The Spectrum also has the added bonus of the best range of software for any colour micro in the UK It is not a huge surprise that Uncle Clive has become Sir Sinclair

Andrew Wiseman
68 Mayfield Road
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Cambridgeshire PE18 7NJ

Not a minor matter

I refer to the article *Turning Turtle* in your issue for 9-15 June which includes the statement It is not difficult to use these routines for a Logo type emulator The routines turn out to be for screen formatting plus an ability to move a turtle forward and to turn it through an angle Your readers without knowledge of Logo and Turtle Graphics must be left in mystification Is that it?! Is that what the Massachusetts Institute of Technology spent their time on?!

Accepting that the article aims at technical detail rather than rationale it is unfortunately only one example of "popular writings" on the subject over the last year which give a corrupted and trivialised view of Logo to the uninformed reader The capability outlined in the article is no nearer to serious Turtle Graphics than a firework rocket is to landing men on the moon

Logo is a language designed to encourage and facilitate learning in the context of a particular educational philosophy Turtle Graphics is a successful and widely used, but only a specialised and partial, realisation of the language Whilst true Turtle Graphics implementations can fit into microcomputers, they are significant software packages, and I would warn readers to be cautious about regarding any magazine listings for such programs as other than toys As a minimum the following language constructs are required

- Instructions to move, turn position and reset the turtle in absolute and incremental modes
- Instructions to name define and call procedures containing combinations of such moves, in hierarchies
- Instructions to provide nestable repeat loops in programs and procedures
- Local (to procedure) and global variables, with arithmetic and variable display capability
- Whilst providing these facilities procedures must be recursive and allow conditional termination
- A range of plotting colour and administrative instructions are needed

To make such a language usable, any real implementation must include a significant operating system with an editor, syntax checking error messages, listing capability and the rest

My regrets to this particular author that his offering has provoked this 'last straw' response Editors equally should ensure that articles clearly state their context and scope. Gross misrepresentation of a promisingly fruitful approach to human development is not a minor matter

M Davies
Lymington Bottom
Four Marks
Alton
Hants GU34 5AH

Boris Allan writes Readers of Ziggurat will know the difference between Logo and Turtle Graphics — my TG routines follow those of UCSD Pascal

I imagined that a Logo-type emulator might be a Logo interpreter written in BBC Basic — I am not silly enough to claim that the routines are like Logo

If Mr Davies looks through his list of requirements, he will see that they are all satisfied by BBC Basic The examples given in my second article (*Popular Computing Weekly*, June 16-22) include all Mr Davies' requirements, even down to recursion.

Over-heated sword!

Sir Clive Sinclair? I trust he will have to wait over 16 weeks before being dubbed and then have the sword overheat

Richard Carsons
3 Cornflower Close
Simons Park
Wokingham
Berks RG11 2UF

Invidia dragonis . . . 2

As a colleague of Mr Andrew Wiseman I wish to explain his computer-induced neurosis The allegation that he envies the Dragon 32 computer is entirely true Mr Wiseman can be described as a "Sinclair freak" as he takes everything Uncle Clive makes and hails it as the best in the world

With the arrival of the ZX Spectrum he happily sold his ZX81 and sent off his Spectrum order form When it finally arrived he was extremely happy, until I decided to purchase a Dragon

With the obvious better features of the Dragon he grew envious and started to find any way possible to criticise the Dragon

I hope that this letter will end this argument once and for all Mr Wiseman should be satisfied with his inferior machine, although it is evident to anyone but a fool that the Dragon is a better computer

I would like to add that I have recently purchased an Oric-1 micro, so any letters from Mr Wiseman slagging off that computer should be ignored as he is just getting neurotic yet again

Michael Smith
57 Pettis Road
St Ives
Huntingdon
Cambs

Legal copying

As a supplier of a tape copier for the Spectrum (plus a ZX81 system), I would like to answer the comment on the legality of such programs (*PCW* 16-22 June)

Copying of tapes always has been *legal* Indeed, the suppliers of all the various games cassettes advertised have their cassettes made by large companies specialising in the copying of cassettes Obviously, a legal process, as is the making of 'back-up' copies of your own cassette for your own use only

It is totally illegal to copy tapes, either by copier programs or by tape-to-tape method, if the copy is for 'giving away' and not for your own use Suggesting the banning of such copier programs has the same validity as suggesting that all photo-copier machines should be made illegal

Further to the above, I am appalled at some of the so-called copies available (I have studied the 'opposition') The majority will copy all programs, including Datafile (headerless type), but some use as much as 750 bytes of your program area In a 16K Spectrum this is about 10 per cent of your usable area

It is unnecessary for a copier to use any of your memory area (Mine uses none, yet still allows the user to simply press a button to make a copy.)

G A Bobker
29 Chadderton Drive
Unsworth
Lancs

Space Docking

A new game for 16K Spectrum by Colin Jones

Your on-board computer has locked on to a satellite that after 10 years in parked orbit around the Earth is to be retrieved for routine servicing

You are aware of a knot of tension in the pit of your stomach as you take the controls of the huge space shuttle preparatory to making the fine synchronisation adjustments necessary for successful docking The grim concentration on your face is a cold blue lit by the flickering light emitted by your data screen. The screen shows an image constantly changing as the satellite moves through space

The gleaming shuttle ponderously rotates towards the tiny fragile satellite as you use the side thrusters to match the spin As the screen indicates that you have achieved synchronisation you nudge your shuttle forward

A huge image now fills the screen to indicate your proximity to the satellite You are within seconds of final dock Panic tries to seize you! You see that the satellite has suddenly started to drift away from you! Have you time to match the new spin before you collide?

Commentary

35-60	Set variables
70-90	Screen display
100-160	Read keyboard
170-260	Display indicators (distance spin sync./time left)
270-290	Display new satellite image
300-340	Set spin factors
350-450	Remove old satellite image/calculate new image
370	NOTE — To see docking complete sequence
460-490	Calculate new spin/approach factors
500-530	Docking completed
580-590	Score new satellite?
610	Ran out of time
620	Crash

Variables

L — cumulative score
J — time remaining
P — horizontal line of sat. image
I — input from keyboard
K — spin display position
RA — rate incr decr distance from
R — size of sat image
RT — rate spin incr decr



```
10 REM SPACE DOCKING
20 REM BY CS JONES
30 REM ************************
35 LET L=0
40 LET K=0. LET J=30  LET AA=1
LET P=0  LET R=5.5  LET I=1
50 LET RT=INT (10*RND)/10  LET
S=INT (100*RND)
58 IF S<50 THEN LET RT=-RT
55 PAPER 1  INK 7  BORDER 1. C
LS
70 CIRCLE 127,87.86  CIRCLE 12
87,84  CIRCLE 127,87,43
80 PRINT AT 0.15,"VV",AT 10.0,
"=" AT 11,0.'='
90 GO TO 400
100 IF INKEY$= " THEN GO TO 330
110 LET Z$=INKEY$· LET I=CODE I
$-48
120 IF I=5 THEN GO TO 320
130 IF I=6 THEN GO TO 470
140 IF I=7 THEN GO TO 460
150 IF I=8 THEN GO TO 300
152 GO TO 100
170 INK 4  PRINT AT 1,0 '▌',AT
20,0,'▌',AT 1+R/10,0,'▌',AT 20-R
/10,0.'▌'  INK 7
180 IF R>=88 AND C>=124 AND C<=
132 AND D>150 THEN GO TO 500
190 IF R>=88 THEN GO TO 620
200 INK 2  PRINT AT J,31, INVER
SE 1: '▌'  LET J=J-.15  INVERSE 0
  INK 7
210 IF J<=1 THEN GO TO 610
220 PLOT INVERSE 1,10.K  DRAW I
NVERSE 1 10,0
230 LET K=87+100*AT
240 IF K>=170 THEN LET K=165
250 IF K<=5 THEN LET K=10
260 PLOT OVER 1,10,K  DRAW OVER
1,10,0
270 PLOT OVER 1,X,Y  DRAW OVER
1,-A,-B
280 PLOT OVER 1,C.C  DRAW OVER
1,B*.5 -A*.5
290 GO TO 100
300 LET RT=RT+.02
310 GO TO 330
320 LET AT=RT-.02
330 LET H=INT (RND*100)  IF H<=
40 THEN GO TO 480
340 IF H>60 THEN GO TO 490
350 LET P=P+RT
360 LET R=R*RA
370 REM **TO TEST LET P=0 HERE*
380 PLOT OVER 1,X,Y  DRAW OVER
1,-A,-B
390 PLOT OVER 1,C,D. DRAW OVER
1,B*.5,-A*.5
400 LET X=127+R*(COS (P+2*PI))
LET Y=87+R*(SIN (P+2*PI))
410 LET C=127+R*(COS (P+1.55+2*
PI))  LET D=87+R*(SIN (P+1.55+2*
PI))
420 LET A=2*(X-127)  LET B=2*(Y
-87)
430 IF A<5 AND A>-5 THEN LET A=
0
440 IF B<5 AND B>-5 THEN LET B=
0
450 GO TO 170
460 LET AA=AA+.01  GO TO 330
470 LET AA=AA-.01  GO TO 330
480 LET AT=AT+.01  GO TO 330
490 LET AT=RT-.01  GO TO 350
500 PLOT OVER 1,0,0  DRAW OVER
1,254,174  PLOT OVER 1,0,174  DR
AW OVER 1,254,-173
510 FLASH 1  PRINT AT 10,12,"DO
CKING"  PRINT AT 11,11,"COMPLETE
"  FLASH 0
520 FOR A=1 TO 15  BEEP .2.15:
BEEP .2.20  NEXT A
530 CLS
540 LET J=INT J
550 LET L=L+J
560 PRINT
570 PRINT "YOUR SCORE WAS ",J;"
PARSECS"
580 PRINT . INVERSE 1  PRINT "Y
OUR CUMULATIVE SCORE IS ",L  PRI
NT  PRINT "ANOTHER SATELLITE ?"
  INPUT A$. INVERSE 0
590 IF A$="Y" THEN GO TO 40
600 STOP
610 CLS  BEEP 2,6  INVERSE 1
PRINT "YOU RAN OUT OF TIME"  GO
TO 540
620 CLS  BEEP 2,5  INVERSE 1.
PRINT "YOU CRASHED INTO THE SATE
LLITE". LET J=0  GO TO 540
```



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FLUSH	OPEN	CLOSE
FILES	END#	RESTORE#
DIM#	BOOT	INPUT
PRINT	FIND	BUILD
OO		IF EOF(x) THEN

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Waiting for Groucho

***David Kelly** lets Automata put some life in Street Life*

"If there is such a thing as an alien, it doesn't want to come down to earth and get killed" observes Mel Croucher.

"I have yet to find an arcade game where there is a full trial at the start" rejoins Christian Penfold.

Automata could become one of the world's great double acts. Then again, they may not. But they have — in their own words — found a niche for themselves in the games software business somewhere between *Monty Python* and *Not the 9 O'clock News*.

For openers, there was *Can of Worms*, more recently *Pimania* starring the infamous *Pi man* himself, and soon there will be *Groucho*.

"Nobody else is in there doing the same kind of things as us — they are all still zapping aliens" says Mel.

"That's pathetic — and not at all what we are concerned with. Maybe it sounds trite but we want to bring back something of the parlour game atmosphere and involve the whole family."

This is by no means the first venture for either Automata or its two founders. Mel has been an architect, bass-player in a rock band and a cartographer. Christian has sold everything from motor cars to magazine space in his time. They have done, and still do, a lot of work for local radio stations — for a while they ran a company making audio promotions of foreign hotels for travel companies.

"That was one of our less successful ventures" says Mel. Christian shrugs. "We did one on the States just before Laker crashed and we followed that up with one on Spain just before the pound plummeted!"

Automata started two years ago on a cross Channel ferry back from just one such tourist guide venture.

"The entire world was throwing-up" recalls Mel with relish "including Christian. I told him about the ZX81 I'd just bought to play with and he wasn't interested!"

Back on dry land however, Christian was hooked — programming the Sinclair machine for 10 hours a day seven days a week.

Christian is keen to point out that he has no responsibility for any of the ideas. He just keeps his head down doing the coding. "I used to write poetry and my programming is just the same — unstructured" he points out helpfully.

Nevertheless, it is Christian who is the business brains. Says Mel "My input is the idea and Christian makes it work. We are very interdependent on each other. We are the company. If we had 50 programmers they would all have to be clones of us — otherwise it wouldn't work."

"We are quite different," says Mel indicating Christian. "He's somewhere to the right of Enoch Powell and I'm to the left of Tony Benn. That's why it works — otherwise we'd come in the morning and agree!"

Each of the Automata programs starts life as an elaborate story-board produced by Mel. First there was a tape called *Can of Worms* for the ZX81 which developed from a 20-page story-board and was condensed down to 1K by Christian.

In April last year the Spectrum was launched and it caught a great many software houses on the hop. "It certainly caused us to stop and think," says Mel. "And when we had thunk we brought out *Pimania*."

To Automata the program concept is more important and takes up much more time than the actual coding. "All the elements have come together with the computer" explains Mel. "I don't have to go and raise £¼m to do a short film — we can do it here. Okay, so the animation is not up to Disney standard but it is coming. I reckon we are up to the standard of the *Flintstones* cartoons now — static backgrounds with moving characters."

The idea behind *Pimania* was a treasure hunt — for a real prize. The Golden Sundial of Pi — worth £6 000. It can be won by solving the clues to be found inside the *Pimania* computer game. "The idea was like *Masquerade*" says Christian "just less successful — we haven't sold 10 million copies!"

"People are obviously worried that it hasn't been won yet — but the prize definitely exists! It hasn't been won because it is rather more than six or seven sentences. It's bloody hard to solve the puzzle — and for £6 000 it ought to be!"

And on top of that, the *Pi-man* has become something of a cult figure. Says Christian. "He is an escape — an extension of our own personalities — all the nice and nasty bits rolled into one. But now he no longer just exists in our minds. He is real. He has his own character."

Automata is now working on the next project — *Groucho*. Why Groucho? "Because," says Mel, "Groucho Marx was a very funny man and he is a kind of salute to the world of entertainment."

In *Groucho* you have to travel the length and breadth of the USA — in the program of course — trying to discover where Groucho is playing each night. It is a world where the currency is cigars and life is a succession of pools, pool halls, bars and casinos.

Hidden somewhere in the game is the identity of a famous Hollywood personality. Find the name and you win yourself a trip on Concorde to New York, £500 spending money, a chance to meet the famous star in Hollywood and a return trip on the *QE2*.

"*Groucho* has been aborted — maybe I should say reconceived — twice now. We planned to launch it in March but we threw it away. We shall only launch it when it is just right — it still hasn't quite got that 'Ting'!"

"It is not a typical adventure. We could have done the *Return of the Pi-man* — in fact he does get a guest appearance for all his expectant fans — but we wanted to do something different."

More than that neither Mel nor Christian will say. All will be revealed in the fullness of time.

"Earlier this year we hit a crisis when *Pimania* took off. In about February we had to put on the brakes and say 'No!'" Mel holds up his hand. "Automata is just the two of us. If we expand too far we will lose everything — we will lose the driving wheel. You probably think we are just two boring old hippys — but we're not as daft as we look."

"Speak for yourself" interjects Christian but Mel continues unabated. "I'm on my fourth time around and Christian is on his second. *Pimania* has been going eight months now. We *think* we know what we are doing and we are not going to blow it by get rich-quick — like the one hit wonders of the record industry."

"We have a drawer full of ideas — some good, some bad. Enough to last us for years." ■

Mel Croucher (left) and Christian Penfold

The mouth of the canon

***Keith end Steven** Brain delve into the Delta disc drive for the Dragon 32 from Premier Microsystems*

For some considerable time the computer press has been full of rumours of the 'imminent launch of a disc system from Dragon Data Ltd But we are still waiting for the Dragon s creators to give him new fire though a prototype was on display at the recent Earls Court computer fair (see opposite page)

In the meantime, independent entrepreneurs have not been idle and a number of alternative disc systems for the Dragon have also been promised Whilst some of these systems are still only pipe-dreams, or prototypes Premier Microsystems has actually reached the market with its *Delta* disc system which is becoming widely available particularly through the Computers for All dealer group

The heart of the system is a plug-in cartridge, containing the disc controller circuit and the 8K Rom containing the *Delta* operating system This external Rom approach means that very little of the standard 32K Dragon memory is reserved for system use, and thus unavailable to the user (1 8K)

The operating system is totally integrated with Dragon Basic so that all normal commands function as usual However, over 30 new or extended Basic commands are also added These new facilities are as easy to use as the original Basic — 26 different clear and comprehensive disc error messages are generated when things start to go astray with your programs

Although Premier supplies complete systems using the two-thirds height, 40-track Canon disc drives the software can be configured to support virtually any available disc drives by the *Config* command which needs six parameters (drive letter, no of tracks, sectors/track, no of sides, step rate data rate) The *Delta* controller cartridge is available alone at £99 95 for those with alternative preferences of disc or perhaps source of supply So if you fancy some 3in MCD 1 miniature versions or can lay your hands on some redundant 8in drives, then setting up is still simple

Up to four drives can be supported and each of these can be configured esparate-ly, so you can even copy from one size to another Both single and double density and single and double sided are supported

At present, Premier is supplying *Delta 1* (single 40-track single sided) at £299 95 and *Delta 2* (single 40 track double sided) at £345 95 both using the single density Canon drives, but the literature specifies systems up to *Delta 8* with two double-sided, double-density (80 track) drives for £679 95

Delta 1 provides 100K of storage This is doubled in *Delta 2*, to 200K and if you really need the space two *Delta 8s* (or is that a 16?) will provide 1 6 megabytes! If even that won t satisfy you, then a change to 8in discs will send you up to 2 5 megabytes though why you are using a Dragon in such an application we can't really imagine

Connection of the Premier system is very straightforward as the controller simply plugs into the cartridge port (power off!!) the disc drive cable is connected the Dragon is powered up the *Delta* message appears in place of the usual Dragon Data line and when any key is pressed it boots up *Dir* will now list the first 14 items on the disc giving filename file type and length in domains (1 domain = 256 bytes) To continue the directory listing just press any key Output can be redirected to the printer by means of a simple *Poke* A mother board, which will allow multiple connections to the cartridge port is promised and *Delta* can also be specified containing the Premier *Encoder 09* two-pass assembler internally

A 75 page A4 looseleaf manual is provided and as adequate documentation can make or break a product we are very pleased to be able to report that this is absolutely first class An errata sheet contained only eight corrections and we did not find any other errors The manual starts with an introduction to the *Delta* system and disc operations in general which is obviously aimed at the novice We particularly liked the line in bold type

REMEMBER >>> IF ALL ELSE FAILS READ THE MANUAL!! <<<

Each *Keyword* is then explained in detail in a standard format

Function
Syntax
Examples
Comments
Associated keywords

Init is the formatting command and as a precaution it requires user confirmation before wiping used discs In addition to being able to handle program files with *Save Savem Load* and *Loadm* you can *Run* and *Runm* which will load and auto-execute your programs A quick comparison indicates that programs load about 10 times faster than from cassette

Chain allows you to load a new program, but carry over variables from the old program *Append* merges the program in the workspace with one on disc although use of *Renumber* may be necessary so, if

line-numbers are identical the disc line will overwrite the line in memory.

Assign has two functions. It allows you to rename files and it can also protect and unprotect files. Protected files cannot be erased with *Kill*, which otherwise deletes named files. A *Verify* operation is normally included as the default, but this can be disabled to speed up access where speed is the most important consideration.

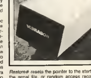
Copy copies a named file from one disc to another, whilst *Back-up* copies the entire disc. These facilities are straightforward and user-friendly, even for the single-drive system we tested, although all the disc-swapping required to *Back up* an entire disc on a single drive tends to make your arms ache! At this point you need to consider how valuable your time is and whether, if your particular applications require routine *Back-up* of data, the extra £145 required to provide 200K as two 40 track single-sided drives, rather than one 40-track double-sided drive, is a sound investment.

Use of *Boot* allows a disc to automatically carry out an instruction as soon as the disc is selected. It can be used to provide further software facilities; for example we used it to automatically provide an on-screen machine-code clock based on Ian Nicholson's program in the June 1983 edition of *Dragon User*. It is also a particularly useful feature for applications software to be used by untrained operators, as it can automatically set a process in motion when the disc is inserted. It can only contain one command, but this is not a problem as it can *Do* an executive file.

Build creates an executive file of up to 255 characters which can contain a series of commands. This saves itself to disc when you press *Break* with your chosen filename and the suffix *Bld*. *Do*" activates the file created with *Build* and can thus set in motion a complex series of events.

Specified areas of memory can be stored as machine code files, so that machine code programs and graphics screens can be saved and reloaded. Extensions of this are *Runm* and *Exec* which allows you to execute from any address. The greater access speed of disc means that graphics screens can be loaded in seconds, an obvious asset in the educational and perhaps adventure game fields.

Dragon Data previewed its own disc system for the first time at the Earl's Court Computer Fair



The half height drive uses 5¼ inch mini-diskettes, with a formatted memory capacity of 184 32K. The Discs are single-sided, double-density, with 40 tracks, 18 sectors per track and 256 bytes per sector.

The drive unit, with either single or double disc drives has a steel case and requires an external power supply. The single disc drive unit weighs 4 4kg.

The drives should be available in the summer. A single disc drive unit will cost £225 with a further £50 for the disc controller. Adding an extra disc to the single unit will be undertaken by Dragon dealers and cost £200.

There is an extensive detailed section in the manual on data files, with a series of clear worked examples. Both serial and random files are supported. *Create* prepares the file and sets aside the specified disc space, while *Flush* clears a data file for re-use under the same name.

Files are *Open*ed and *Closed* as in Microsoft Basic, but up to eight files may be *Open* at the same time. When more than one file is to be open simultaneously *Files* is used to set aside buffer space in memory for each channel. *Print#* puts data into a file and *Input#* reads it back. *End#* moves the read/write pointer to the end of the serial file or random access *Restore#* resets the pointer to the start of the serial file, or random access record, and *If Eof(N) Then* has the normal error-trapping function.

Dim# is an extension of the normal Basic command which allows you to set the length of a random access record. The default is the industry standard of 128 bytes, but it can set to any value from 1 to 255 as required. This is very important for optimal use of memory and simple programming. The main difficulty with random access files is remembering on which record a particular item of data was stored, but this can be overcome with indexing, where a small serial file provides an index for a large random access file.

A particularly useful and flexible command is *Find*, which will perform rapid comprehensive searches for a specified string. In a serial file, *Find* followed by *Input#* will input the target string from its start — and in a random access record will input the *Record* containing the string. As the search starts from the current file pointer position, this must be *Restored* for a complete search.

Random access searches start from a specified record number. Wild characters are allowed and are indicated with "*", so that partial matches can be easily searched for. For example consider what P** **** C******** W***** might turn up.

At around £300 the simplest disc system will set you back getting on for twice the new low price for the Dragon, so do you really need one and can it be worth the expense? Well, as always, that depends on what you want to do with your computer. If you are simply an arcade-games freak then just forget it, unless you have more money than sense, as the only potential advantage is the ability to load up your favourite program faster. And even that is rather a vain hope, as most new machine-code software is heavily protected against copying.

The most obvious candidate for a Dragon disc system is the small business where cassette files for data and/or text are not really a very practical proposition. When a customer is on the line asking if an item is in stock, he does not really want to know about the vagaries of your cassette loading, or wait for the record at the end of the tape to be reached — the rapid access to large databases available with disc is invaluable.

In addition to the business sector, increasing numbers of 'serious' hobbyists are beginning to consider that disc systems are not beyond their pockets. We are waiting impatiently for a disc-based word-processing system for the Dragon.

The question of how *Delta* will stand up against the competition must be very much to the fore, but in the continued absence of visible alternatives it must be getting a clear head start. Peter Rihan of Premier indicated that 60 percent of their sales so far have been complete systems, and claimed current sales/orders of 2000 units.

The *Delta* disc system is a very professional product and it looks as if Premier are going to support it properly. A nice touch, especially in view of the potentially large number of new disc users, is the Customer Service Session from 7 to 9 pm on Monday evenings when you can phone in with your problems. We tried this out whilst seeking more information on the system and got a very helpful response.

In our opinion *Delta* deserves to be a success, but that will also depend on how quickly commercial software becomes available for it. We understand that a number of software houses have taken an interest in the Premier system and that in particular MSD Consultants have some business programs ready. The longer other systems are delayed, the more likely it is that other programmers will write for *Delta* and that it's early beachhead will develop into a successful campaign. ■

Close to critical

***Andrew Thompson** presents five programs to help 'O' level pupils with their studies*

With computers now an everyday part of our lives they are being used in many different areas One of these fields is education and while the teacher will never be replaced the computer serves as a useful tool

Here are five short concise programs concerned with topics covered in schools at O level They are all scientific programs demonstrating theorias such as radioactive decay and refraction of light In this sort of program a common difficulty is the equation with many factors

A=1/(B•C−D)

Any value can be found if all the others are known the problem arises when the unknown value has not been isolated (ie *B C D*) The following programs get round this by holding all possible combinations of the equations A student would be expected to isolate any particular value if required

Refraction This program demonstrates the connection between ingoing and outgoing rays of light when they pass through glass or plastic It explains why things become distorted and water looks shallower than it actually is The angle of incidence (*I*) and the angle of refraction (*R*) are linked by the equation

N=SIN(I)/SIN(R) — SNELL S LAW

Where *N* = the refractive index, a constant for a particular material eg glass = 1 5

Program notes

70	If no null input then re-enter values
65 & 67	Convert degrees to radians
80 100	Compute unknown value
115-117	Convert radians to degrees

Critical angle Another program concerning light it explains why light is reflected at a glass air boundary if the angle of incidence is too great This also relates to the refractive index When a ray of light passing from a dense medium to a less dense medium exceeds the critical angle the boundary ceases to be transparent and acts like an everyday mirror

C=ARC SIN(1 N)

Program notes

90	Convert degrees to radians
100	Re-enter if no null input
110-120	Computer unknown value
130	Convert radians to degrees

Radioactive decay When elements emit radiation, they decay at a constant rate with respect to their mass The half-life of an element is the time taken for that element to decay to half its former mass

This can be demonstrated in class by

Continued on page 19

RAY OF LIGHT

ALL ANGLES MEASURED TO THE VERTICAL

AIR

GLASS

I ANGLE OF INCIDENCE

r = ANGLE OF REFRACTION

N = SIN I / SIN r

REFRACTION OF A RAY OF LIGHT

R E F R A C T I O N

```
10 REM REFRACTION
20 PRINT"REFRACTION OF LIGHT IS GOVERNED"
30 PRINT"BY:"
40 PRINT"N=SIN(I)/SIN(R) - SNELL'S LAW"
50 PRINT"ENTER N,I,R,0=UNKNOWN VALUE"
60 INPUTN
62 INPUTI
64 INPUTR
65 LET I=3.1415*I/180
67 LET R=3.1415*R/180
70 IF (N*R*I)<>0 THEN GOTO 50
80 IF N=0 THEN LET N=SIN(I)/SIN(R)
90 IF I=0 THEN LET I=ASN(N*SIN(R))
100 IF R=0 THEN LET R=ASN(SIN(I)/N)
115 LET I=180*I/3.1415
117 LET R=180*R/3.1415
120 PRINT"N=",N
130 PRINT"I=",I
140 PRINT"R=",R
150 D=ABS(I-R)
160 PRINT"PATH DIFFERENCE",D
```

CRITICAL ANGLE

```
10 REM CRITICAL ANGLE
20 PRINT"TOTAL INTERNAL REFLECTION OCCURS"
30 PRINT"WHEN LIGHT PASSES FROM A DENSE"
40 PRINT"MEDIUM INTO A LESS DENSE MEDIUM"
50 PRINT"AT AN ANGLE GREATER THAN THE"
60 PRINT"CRITICAL ANGLE.THIS EQUALS:-"
70 PRINT"N=1/SIN(C)  C=CRITICAL ANGLE"
75 PRINT"ENTER N,C  0=UNKNOWN VALUE"
80 INPUT N
85 INPUT C
90 C=3.1415*C/180
100 IF (N*C)<>0 THEN GOTO 75
110 IF N=0 THEN N=1/SIN(C)
120 IF C=0 THEN C=ASN(1/C)
130 C=180*C/3.1415
140 PRINT"N=",N
150 PRINT"C=",C
READY.
```

giving each pupil a number of dice Then, the dice are thrown and all sixes are removed This continues until all the dice are removed

Program notes

60 80	Ensure valid input
130-150	Toss the dice
160-175	Report on population

Prime number A number is said to be prime if it has no divisors other than itself and unity (1) The apparently random distribution of primes in the number system still frustrates mathematicians Checking for primes becomes tedious as numbers increase This program divides a number by every number under its square root

Program notes

65	Ensure valid input
70	Scan all numbers under the square root
100	Address for line 80

Equation of a line A recurrent 'O' level maths topic is the establishment of the equation of a line on a graph Many questions take the form of several points on a graph where you have to work out another point

In fact only two points on a straight line are required to deduce the equation of the line The program requests these two and computes the equation of the line joining the points Try writing down two points, working out the equation and then checking with the computer.

Program notes

130	Calculate gradient
140	Calculate data zero

All the programs are written in standard Basic and are designed to run on most micros ■

```
RADIOACTIVE DECAY

10 REM RADIOACTIVE DECAY
20 PRINT"THE RADIOACTIVE DECAY OF AN
   ELEMENT"
30 PPINT"CAN BE SIIMULATED BY THROWING
   DICE AND"
40 PRINT"PPOGRESSIVELY REMOVING ALL
   SIXES"
50 PRINT"THPOWN."
60 PRINT"HOW MANY DIE TO BEGIN WITH"
70 INPUT D
80 LET D=ABS(INT(D))
85 LET R=0
90 IF D=0 THEN GOTO 60
120 R=P+1
130 FOR A=1 TO D
140 IF INT(6*RND(1)+1)=6 THEN LET D=D-1
150 NE'T A
160 PRINT"ROUND",R
165 REM SCROLL IF ZX-81
170 PRINT"SIZE",D
175 REM SCROLL IF ZX-81
180 GOTO 90
READY.
```

```
PRIME NUMBER
 10 REM PRIME TEST
 20 PRINT"A NUMBER IS SAID TO BE
    PRIME"
 30 PFINT"IF IT HAS NO DIVISORS
    OTHER"
 40 PPINT"THEN ITSELF AND UNITY
    (1)"
 50 PFINT"ENTER A NUMBEP TO BE
    TESTED"
 60 INPUT N
 65 IF N<3 OR N<>INT(N) THEN GOTO
    60
 70 FOP A=2 TO SQR(N)
 80 IF N/A<>INT(N/A) THEN NEXT:
    PRINT"PRIME!":GOTO100
 90 PRINT"NOT PRIME.":A=SQR(N):
    NEXT A
 100 END
READY.
```

```
EQUATION OF A LINE

10 REM EQUATION OF A LINE
20 PRINT"A STRAIGHT ON A GRAPH"
30 PPINT"CAN BE EXPRESSED BY THE EQUATION"
40 PRINT"Y=M*X+C"
50 PRINT"IF TWO POINTS ON A LINE ARE KNOWN"
60 PRINT"THE EQUATION CAN BE CALCULATED."
70 PRINT"ENTER TWO POINTS (X.Y)"
80 PRINT"POINT 1"
90 INPUT X1
95 INPUT Y1
100 PRINT"POINT 2"
110 INPUT X2
115 INPUT Y2
130 M=(Y1-Y2)/(X1-X2)
140 C=Y1-M*XI
150 PRINT"Y="M"*X+"C
READY.
```

Input error — nonsense in Basic

***Ian Logan** looks at syntax checking in the second of a five-part series*

The three Sinclair machines — the ZX80 ZX81 and Spectrum — have proved to be very popular machines, and this success is partly due to the inclusion of 'syntax checking

To the user the syntax checker appears to be that part of the operating system that stops faulty Basic lines being copied from the editing area at the bottom of the TV screen to the program area at the top of the screen Indeed when the syntax checker finds a mistake a flashing question mark appears in the edit-line at a point where the syntax has failed The user can then amend the Basic line and try to have it accepted a further time Note that direct Basic lines are also checked for correct syntax before being executed

The syntax checker is therefore concerned with the identification of syntax errors in the edit-line and is called on every occasion the user leaves the editor by pressing the *Enter* key In fact the syntax checker is also called to check the syntax of the input-line when the user is responding to an *Input* prompt

So, what is the syntax checker actually doing? Well this is a simple question but the answer may appear far from simple unless the reader understands the difference between syntax errors and run-time errors

A syntax error occurs when the computer finds that the user has entered a line that in some manner has failed to make sense A run-time error occurs however when the computer finds that it cannot manage the task set by the user not because the sense of the statement is not correct but because the operating system just does not allow it As a first example consider the statement 10 LET = B

that can be entered, using the editor into the edit-line But when the *Enter* key is pressed a syntax error is signalled The mistake is one of syntax fails because the user has not placed a variable between the '*Let*' and the '=' The syntax checker 'insists' that in a *Let* statement the command word is followed by

- characters that form a valid variable name the character
- characters that form an expression — numeric or string to match the type of variable used
- either a carriage return — end of the Basic line or a : — end of the Basic statement.

and it is the checking for these four items that constitutes the task of the syntax checker when examining a *Let* statement

If the user were now to change the statement to read 10 LET A = B

then the syntax of the *Let* statement would be satisfied But, if the user executes this one line program by entering *Run* and *Enter* the operating system will give a run-time error because it cannot find a suitable value for *B* The system has been asked to do something that is just not allowed It is of interest that in some other microcomputers such a statement does not give a run-time error, as the manufacturers have asked the system programmer to give 'undeclared' variables the value zero (for example)

In the Spectrum system, there are 50 different Basic commands *Let, Run, Cls* and in the parameter table at *6776 (1A7Ah)* to *6934 (1B16h)* is to be found a corresponding set of parameter items for each of the commands

In the case of the *Let* command the entries are

address dec	(hex)	entry dec	(hex)
6778	(1A7A)	1	(01)
6779	(1A7B)	61	(3D)
6780	(1A7C)	2	(02)

and from these entries the operating system understands that the syntax for a *Let* command has to have the four conditions as outlined earlier This is performed in the following manner the first entry — *01* — is collected once the operating system has determined that it is dealing with a *Let* command This value signifies that the *Let* is to be followed by a variable, as this is the condition given in the *Class-01* subroutine at *7199 (1C1Fh* —called *Tem1* by Sinclair)

The scanning of the characters in the *Let* statement that form the variable name, shows very nicely just what points are checked by the syntax checker and what is left alone The first action of the *Class 01* subroutine is to call the *Look Vars* subroutine — *10418 (28B2h* and called *Find_n* by Sinclair) This subroutine checks to see if the variable has the correct form

The system variable *Ch_add* is used as a pointer to each of the characters in the *Let* statement as they are required Bit 6 of the system variable *Flags* is set if the variable is of the numeric type and reset if string The carry flag is always returned reset as syntax is being checked If there should have been an error — such as the user submitting the line

10 LET AB$ = (where there are two letters before the $)

Address		Name	Action
24	(0018h)	GET-CHAR	;The byte addressed by CH_ADD ;goes into the A register. ;Spaces and control codes are ;ignored.
32	(0020h)	NEXT-CHAR	;CH_ADD is advanced before ;GET-CHAR is called.
7293	(1C82h)	EXPT-1NUM	;The next number goes onto the ;calculator stack.
7308	(1C8Ch)	EXPT-EXP	;The next string expression ;goes onto the calculator stack.
7828	(1E94h)	FIND-INT1	;The number on the top of the ;calculator stack goes into the ;A register.
7833	(1E99h)	FIND-INT2	;Number to BC register pair.
9467	(24FBh)	SCANNING	;The next expression is ;evaluated - the result goes on ;the calculator stack.
11249	(2BF1h)	STK-FETCH	;A set of string parameters is ;taken off the calculator stack. ;BC = length, DE = base address.

then syntax will have failed at this stage. When this occurs the user is returned to the editor and the edit-line is printed with a flashing question mark at the point that *Ch_add* had reached when the error was identified.

The second entry — *3D* — is now considered. This code is the Ascii representation of the '=' character and is the separator required at this stage. The code addressed by the system pointer *Ch_add* is compared to the '=' code. If they match, then the syntax condition is satisfied and *Ch_add* is advanced before proceeding to the next stage. However, if the codes do not match, then the user is returned to the editor.

The third and final entry — *02* — can now be used. This code indicates that the subroutine *Class 02 — 7246 (1C4Eh* and *Tem2)* is to be called. This subroutine is a little complicated, but essentially there are two tasks to be performed:

- Scan the next expression by calling SCANNING — 9487 (24FBh and EXPRN) to ensure that the characters form a meaningful expression.
- Match the type of the variable to that of the expression, giving a syntax error if they are not both numeric or both string.

The only condition that remains to be handled is the requirement that the statement must now be at its end. This is done at the end of every statement — the subroutine *Check end — 7150 (1BEEh* and *End?)* does no more than compare the character addressed by *Ch_add* against the characters carriage return and ':'. If there is an error, the user is returned to the editor as usual. Otherwise, the syntax of the whole statement has been accepted and the operating system is ready to consider the next statement. If there are no further statements, then the operating system allows the line to be accepted and used accordingly.

This discussion of the syntax checking procedure for a *Let* command shows that the syntax checker is only concerned with 'series'. At no stage are variables created, values assigned, expressions evaluated or run-time errors considered.

There is, however, in the Spectrum system a very special action undertaken by the syntax checker and that is the insertion of hidden floating-point forms' after numeric values as they occur in expressions. This operation is performed by the *Scanning* subroutine and makes the evaluation of expressions faster in run-time. It is interesting to note that if syntax fails further along a line, then the floating-point forms have to be removed from the whole line before a return is made to the editor.

The *Let* command uses two of the command class routines that are found in the Spectrum's operating system. Details of all the command classes are to be found in table 1.

The parameter table contains entries for all the Basic commands and, as a further example, the steps involved in handling a *Run* statement will now be outlined. The entries for *Run* are:



address dec	(hex)	entry dec	(hex)
6827	(1AAB)	3	(03)
6828	(1AAC)	161	(A1)
6829	(1AAD)	30	(1E)

In this case, the first entry shows that 'a numeric expression may follow — zero to be used in case of default'. The second and third entries form the address of the run-time command routine and are not used in syntax time. The *Class 03 — 7181 (1C0DH* and *Tem3)* contains the two steps:

- Call FETCH-NUM — 7390 (1CDEh and OPTNO) which in syntax time confirms that any characters that are present in the statement do indeed form a numeric expression.
- Check that the end of the statement has been reached.

These examples show how syntax is managed in the 'old' Spectrum Rom, but the mechanisms involved form an integral part of the operating system and it is difficult to use them in one's own programs. However, the shadow Rom of the microdrive/network/RS232 interface, includes a provision for extending the Basic interpreter should the user so wish.

The shadow system variable *Vector — 23735 (5CB7h)* — contains the vectored address to the end of the command-search in the shadow Rom. This address may be changed by the user and further tests conducted before returning. Should one of the new tests indicate a certain condition, then this can be acted upon and in effect a new Basic command added to the existing set.

As an example, let me show how the new command — *Cls#* — has been added to the existing set of Basic. This new command allows the user to 'clear the screen and revert to the original colours', ie white paper, black ink, etc.

In the command-search a test is made for the command *Cls*, realising that at this point the 'old' Rom would have handled this command word if it had been followed by a carriage return or ':' character. Once found, the syntax time routine for *Cls* is entered. Here *Ch_add* is advanced and the present character compared to the 'hash' code, ie *35 (23h)*. If the codes do not match, then there has been an error, otherwise the code is accepted and *Ch_add* advanced once again.

Now a check is made to ensure that the end of the statement has been reached — again an error if not. This stage now marks the end of the syntax checking and a 'return' is made, carefully, to the appropriate place in the 'old' Rom so that the next statement can be considered.

It is envisaged that the adding of new commands to the Spectrum's Basic, whilst perhaps never being particularly useful, will be taken up by many hobbyists as they vie to make toolkits, new languages and many other interesting programs.

In the next article, run-time will be considered. ■

Putting the months into perspective

Ian Robertson presents a monthly barchart program complete with damonstration routine

Having just ecquired a BBC Model B for use in school I was most impressed by a program called *Monthly* among the demonstrations in the Users Guide. The following is an attempt to produce something similar (albeit not in perspective) on my true and trusted Dragon

Program notes

Line

90 Dimension arrays to hold graph data and strings to print the months on the hi-res screen

100-180 Loop to input the data. For demonstration purposes this READs the data rather than INPUT's it. The increment of M(N) in line 140 is to allow room for the months at the bottom of the hi-res screen. Line 160 prevents the DRAW instructions going out of range

190-210 Loop to read data for month DRAW strings

220-260 Stop and start instructions.

270-410 Calculate and draw the bars in alternating colours. Lines 370-380 draw a box in the background colour in the same position as the filled boxes in order to separate the bars

420-470 Data for demonstration and month DRAW strings

```
10 REM ***********************
20 REM *                     *
30 REM *  DRAGON BARGRAPH.   *
40 REM *  (C)IAN ROBERTSON   *
50 REM *    12 JUNE 1983     *
60 REM *                     *
70 REM ***********************
80 CLS
90 DIMM(12),A$(12)
100 FORN=1TO12
110 PRINT"ENTER DATA FOR EACH MO
NTH"
120 PRINT @64,"MONTH";N
130 REM*************************
      TEMPORARY READ STATEMENT
      FOR DEMONSTRATION.
      REPLACE WITH 'INPUT'.
      AND DELETE DEMO DATA,
      (LINE430).
140 READM(N):M(N)=M(N)+10
150 REM*************************
160 IFM(N)>191THENM(N)=191
170 CLS
180 NEXT
190 FORN=1TO12
200 READA$(N)
210 NEXT
220 PRINT@98,"TO SEE GRAPH PRESS
spacebar"
230 PRINT@224,STRING$(32,"£")
240 PRINT@290,"spacebar AGAIN FO
R NEW GRAPH"
250 SCREEN0,1
260 IFINKEY$=""THEN260ELSE270
270 PMODE3,1:PCLS:SCREEN1,1
280 N=17
290 FORN1=1TO12
300 DRAW"BM"+STR$(N)+",191C7"+A$
(N1):N=N+20
310 NEXT
320 C=2:X=7
330 COLORC
340 FORN=1TO12
350 COLORC
360 LINE(X,182)-(X+20,191-M(N)),
PSET,BF
370 COLOR5
380 LINE(X,182)-(X+20,191-M(N)),
PSET,B
390 X=X+20:C=C+1
400 IFC>4THENC=2
410 NEXT
420 REM*************************
      DEMONSTRATION DATA
430 DATA 123,3,73,187,69,100,57,
65,87,32,145,150
440 REM*************************
      DATA FOR MONTH LETTERS
450 DATA BL4R3U8L2R4,U4NR1U4NR4,
BL4U8F4E4D8,BL4U4NR6U4R6D8,BL4U8
F4E4D8,BL4R3U8L2R4,BL4R3U8L2R4,B
L4U4NR6U4R6D8
460 DATA BL4R6U4L6U4R6,BL4R6U8L6
D8,BL4U8BD1F6BD1U8,BL4U8R4F2D5G2
L4
470 REM*************************
480 IFINKEY$<>CHR$(32)THEN480ELS
ERUN
```

Squaring the powers of the assembly

***Jeremy Ruston** explains how to compute powers of numbers in assembly language*

As well as multiplication and division, it is fairly easy to take the powers of numbers in assembly language (for example 2 to the power of 3 is two multiplied by itself three times which is eight. In Basic this is *Print 2^3*)

There are several reasons why we should wish to be able to compute powers of numbers. A simple compiler or interpreter that only supports integer arithmetic can use this method to implement powers without needing floating point arithmetic. I find the most common use of the power operator is to help in extracting bits from a byte.

In addition, many arithmetic and numerical analysis techniques require power calculations. For example, we shall examine how to compute X to the power of N given X and N, and assuming N is a positive integer.

Let us assume we want to find X to the power of 16. We could start with X and multiply it by X 15 times. This is the obvious way to do it but it is needlessly complex and slow. It is possible to obtain the same answer with only four multiplications, as opposed to 15, if we repeatedly take the square of each partial result. This will yield the partial answers X^2, X^4, X^8 and X^{16}. This result is extracted from the basic laws of indices, which state that $(X^N)^M$ is the same as $X^{(N*M)}$

The same idea can be applied to any value of N in the following way

(1) Write the number N in binary, but omit any zeros on the left, ie, the first digit must be a 1
(2) Replace each 1 in the number by the pair of letters *SX* and replace each zero by the letter *S*
(3) Cross off any *SX* pairs that appear on the left
(4) The result is a sequence of the letters *S* and *X*. Oddly enough, this result can be used for computing X to the power of N
(5) *S* is interpreted as the operation of squaring and X is interpreted as the operation of multiplying by X

For example, I shall work through the above method if N is equal to 23. The binary representation of 23 is 10111. This gives a letter sequence of *SX S SX SX SX*. We can remove the leading *SX* to gain the answer *S SX SX SX*.

This rule states that we should square the number twice, then multiply by X, square it again, multiply by X, square it and then multiply by X. We would be successively computing X^2, X^4, X^5, X^{10}, X^{11}, X^{22} and X^{23}. This binary method is pretty easy to translate into assembly language as long as you have a suitable multiplication routine like those we have discussed previously.

A computer program to do all this often bears very little resemblance to the above algorithm. The method used to find X^N is as follows

(1) Set Y to 1 and Z to X
(2) Shift N right. If the bit that fell off was zero, go on to step 5
(3) Set $Y = Z * Y$
(4) If $N = 0$ the program has finished, the answer is Y
(5) Set $Z = Z * Z$
(6) Go back to step 2

This can be encoded in a simple Basic program (see below)

You can trace through this program by hand to see exactly how the algorithm works. You may also like to encode the program into assembly language. If you decide to do so, I would recommend you stick a limit of one byte on the lengths of all the variables used ■

This is an extract from *The BBC Micro Compendium* available from 1 August from Interface Publications, 44-46 Earls Court Road, London W8 6EJ

```
10 REM POWER
20
30 REM Binary method for exponentiation
40
50 REM (c) 1983 Jeremy Ruston
60
70 INPUT "What do you want to the power of what:"Z,N
80
90 REM Step 1:
100 Y=1
110
120 REM Step 2:
130 N=N/2
140 IF N=INT(N) THEN GOTO 230
150 N=INT(N)
160
170 REM Step 3:
180 Y=Z*Y
190
200 REM Step 4:
210 IF N=0 THEN PRINT "Answer:";Y:END
220
230 REM Step 5:
240 Z=Z*Z
250
260 REM Step 6:
270 GOTO 120
```


Open Forum is for you to publish your programs and ideas. Take care that the listings you send in are all bug-free. Your documentation should start with a general description of the program and what it does and then give some detail of how the program is constructed. We will pay the *Program of the Week* double our new fee of £6 for each program published.

Dragman

on Dragon

This game resembles Pacman. The program uses the two different speed modes in the processor (do not use fast unless you are sure your Dragon can handle it). The game consists of three Ghosts, three Dragmen and four Power pills.

The game will become progressively harder. Many Dragon owners have been wondering how to achieve continuous movement by using *Inkey$*. I have managed this by introducing another variable.

Program notes

10-60	Rem lines
70	Game type and Instruction
80 120	Variables
130-316	Set up screen
320 530	Movement
540 710	Ghosts movement
720-800	Screen Data
810-850	Routine for dead Dragman
860-1130	Chase
1140-1250	End
1260 1520	Increase speed and instructions
1530 1580	Game Type

Variables

NS= Sheet number
DL= Dragmen left
SC= Score
HI= High
HI$= Highest scorer
G1,2,3= Three ghosts position
X= Position of Dragmen
XG= Game type

PROGRAM OF THE WEEK

```
10 REM ******************
20 REM ***  DRAGMAN BY ***
30 REM *** SIMON GREEN ***
40 REM *** (C) 12/2/83 ***
50 REM ***  8K PROGRAM ***
60 REM ******************
70 GOSUB 1530:GOSUB 1320
80 REM *** VARIABLES ***
90 TG$="G":NS=1:HS$="DRAGON"
100 DIM BS(463):PL=3:HI=5000
110 BS(100)=3:BS(122)=3:BS(356)=3:BS(378)=3:BS(335)=4:
    BS(276)=5:BS(239)=5:BS(240)=5
120 G(1)=238:G(2)=239:G(3)=240:X=335
130 REM *** SET UP GAME ***
140 FOR F=63 TO 415 STEP 32:BS(F)=1:NEXT F:CLS
150 FOR SD=1 TO 84:READ SN:BS(SN)=1:PRINT @SN,CHR$
    (175);:NEXT SD
160 PRINT @G(1),"G";:PRINT @G(2),"G";:PRINT @G(3),"G";
    :PRINT @X,"C";
170 IF BS(100)=3 THEN PRINT @100,"O";
180 IF BS(122)=3 THEN PRINT @122,"O";
190 IF BS(356)=3 THEN PRINT @356,"O";
200 IF BS(378)=3 THEN PRINT @378,"O";
210 FOR SD=64 TO 414
220 IF AA=1 THEN IF BS(SD)=0 OR BS(SD)=1 OR BS(SD)=3 OR
    BS(SD)=4 OR BS(SD)=5 THEN 250
230 IF BS(SD)=1 OR BS(SD)=3 OR BS(SD)=4 OR BS(SD)=5
    THEN 250
240 BS(SD)=2:PRINT @SD,"*";
250 NEXT SD
260 PRINT @0,"score=";SC;:PRINT @13,"hi=";HI;:PRINT @23,
    "lives=";PL;
270 PRINT @453,"dragman by simon green";
280 PRINT @482,"sheet=";NS;
290 PRINT @63,"h";:PRINT @95," ";:PRINT @159,"x";
300 FOR F=1 TO LEN(HS$):PRINT @F*32+159,MID$(HS$,F,1);
    :NEXT F
310 PRINT @F*32+159,"x";
320 REM *** MOVE DRAGMAN ***
330 ZZ$=INKEY$
340 IF ZZ$="" THEN ZZ$=Q$
350 IF ZZ$=CHR$(9) THEN X1=1
360 IF ZZ$=CHR$(8) THEN X1=-1
370 IF ZZ$=CHR$(94) THEN X1=-32
380 IF ZZ$=CHR$(10) THEN X1=32
390 X=X+X1
400 IF X=463 THEN PRINT @431," ";:X=47:GOTO 440
410 IF X=15 THEN PRINT @47," ";:X=431
420 IF BS(X)=1 THEN X=X-X1:GOTO 530
430 PRINT @X-X1," ";
440 PRINT @X,"C";
450 Q$=ZZ$
460 IF BS(X)=2 THEN SC=SC+10:PRINT @6,SC;:BS(X-X1)=0:
    SOUND 220/TG,1:ND=ND+1:IF ND=213 THEN 1260
470 IF SC>=8000 AND KK=0 THEN PL=PL+1:PRINT @29,PL;
    :GOTO 490
480 GOTO 500
490 FOR F=1 TO 5:PRINT @492,"extra dragman";:FOR F1=1
    TO 200:NEXT F1:PRINT @492,"";:FOR F1=1 TO 200:NEXT
    F1,F:KK=1
500 IF BS(X)=3 THEN SC=SC+40:PRINT @5,SC;:BS(X-X1)=0:
    BS(X)=0:PLAY"O3T30CDEFGFEDCDEFG":ND=ND+1:IF ND=213
    THEN 1260 ELSE 860
510 IF G(1)=X OR G(2)=X OR G(3)=X THEN 810
520 BS(X)=0
530 FOR U=1 TO NS:GOSUB 540:NEXT U:GOTO 330
540 REM *** MOVE GHOSTS ***
550 FOR J=1 TO 3
560 RM=RND(4)
570 IF RM=1 THEN MG=-32
580 IF RM=2 THEN MG=1
590 IF RM=3 THEN MG=32
600 IF RM=4 THEN MG=-1
610 G(J)=G(J)+MG
620 IF G(J)=15 THEN PRINT @47," ";:G(J)=431
630 IF G(J)=463 THEN PRINT @431," ";:G(J)=47:PRINT @G(J),
    TG$;
640 IF BS(G(J))=1 THEN G(J)=G(J)-MG:GOTO 710
650 PRINT @G(J),TG$;
660 IF BS(G(J)-MG)=2 THEN PRINT @G(J)-MG,"*";:GOTO 690
670 IF BS(G(J)-MG)=3 THEN PRINT @G(J)-MG,"O";:GOTO 690
680 BS(G(J)-MG)=0:PRINT @G(J)-MG," ";
690 IF G(J)=X AND DO=0 THEN 810
700 IF G(J)=X THEN SC=SC+(100*NS):PRINT @6,SC;:PRINT
    @G(J)," ";:G(J)=237+J:PLAY"O3T30CDCDC":X=335:Q$=""
710 NEXT J:RETURN
720 REM *** SCREEN DATA ***
730 DATA 32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,48,
    49,50,51,52,53,54,55,56,57,58,59,60,61,62,64,68,69,
    73,78,80,85,89,90,94
740 DATA 96,98,103,107,108,110,112,114,115,119,124,126,
```

Continued over the page

```
128,132,133,135,137,140,146,149,151,153,154,158
750 DATA 160,162,120,174,175,176,180,188,190,192,196,
    197,199,200,204,210,214,215,217,218,222
760 DATA 224,226,231,232,234,235,236,242,243,244,246,247,
    252,254
770 DATA 256,260,261,263,264,268,274,278,279,281,282,
    286,288,290,298,302,303,304,308,316,318
780 DATA 320,324,325,327,329,332,338,341,343,345,346,350,
    352,354,359,363,364,366,368,370,371,375,380,382,384,
    388,389
790 DATA 393,398,400,405,409,410,414,416,417,418,419,420,
    421,422,423,424,425,426,427,428,429
800 DATA 430,432,433,434,435,436,437,438,439,440,441,442,
    443,444,445,446
810 REM *** DRAGMAN CAUGHT ***
820 PL=PL-1:OO=0
830 RESTORE:PRINT @X,"c";:AA=1
840 PLAY"O3T3GFEDC"
850 IF PL=0 THEN PRINT @29,PL;:GOTO 1140 ELSE Q$="":
    GOTO 120
860 REM *** CHASE GHOSTS ***
870 OO=1:TG$="s"
880 FOR U=1 TO 160/NS/2:FOR F=1 TO NS:GOSUB 540:NEXT F
890 ZZ$=INKEY$
900 IF ZZ$="" THEN ZZ$=Q$
910 IF ZZ$=CHR$(9) THEN X1=1
920 IF ZZ$=CHR$(8) THEN X1=-1
930 IF ZZ$=CHR$(94) THEN X1=-32
940 IF ZZ$=CHR$(10) THEN X1=32
950 X=X+X1
960 IF X=463 THEN PRINT @431," ";:X=47:GOTO 1000
970 IF X=15 THEN PRINT @47," ";:X=431
980 IF BS(X)=1 THEN X=X-X1:GOTO 1120
990 PRINT @X-X1," ";
1000 PRINT @X,"C";
1010 Q$=ZZ$
1020 IF BS(X)=2 THEN SC=SC+10:PRINT @6,SC;:BS(X-X1)=0:
    SOUND 220/TG,1:ND=ND+1:IF ND=213 THEN 1260
1030 IF SC>=8000 AND KK=0 THEN PL=PL+1:PRINT @29,PL;:
GOTO 1050
1040 GOTO 1060
1050 FOR F=1 TO 5:PRINT @492,"extra dragman";:FOR F1=1
    TO 200:NEXT F1:PRINT @492,"";:FOR F1=1 TO 200:
    NEXT F1,F:KK=1
1060 IF BS(X)=3 THEN SC=SC+40:PRINT @6,SC;:BS(X-X1)=0:
    PLAY"O3T30CDCDC":ND=ND+1:IF ND=213 THEN 1260
1070 IF G(1)=X THEN SC=SC+(100*NS):PRINT @6,SC;:PRINT
    @G(1)," ";:PLAY"O3T30CDCDC":G(1)=238:BS(X)=0:
    X=335:Q$=""
1080 IF G(2)=X THEN SC=SC+(100*NS):PRINT @6,SC;:PRINT
    @G(2)," ";:PLAY"O3T30CDCDC":G(2)=239:BS(X)=0:
    X=335:Q$=""
1090 IF G(3)=X THEN SC=SC+(100*NS):PRINT @6,SC;:PRINT
    @G(3)," ";:PLAY"O3T30CDCDC":G(3)=240:BS(X)=0:
    X=335:Q$=""
1100 PRINT @X,"C";
1110 BS(X)=0
1120 NEXT U
1130 OO=0:TG$="G":Q$="":GOTO 320
1140 REM *** GAME ENDS ***
1150 FOR F=1 TO 1000:NEXT F
1160 IF SC>HI THEN HI=SC:JJ=1
1170 CLS:PRINT"YOUR SCORE=";SC
1180 PRINT:PRINT"HIGHEST SCORE SO FAR=";HI
1190 IF JJ=1 THEN PRINT:INPUT"ENTER YOUR NAME";
    HS$:ELSE 1210
1200 IF LEN(HS$)>8 THEN PRINT:PRINT"NAME TOO LONG":
    PRINT"MAX LENGTH=8 LETTERS":GOTO 1190
1210 PRINT:PRINT"ANOTHER GAME (Y/N)"
1220 AG$=INKEY$:IF AG$="" THEN 1220
1230 IF AG$="Y" THEN RESTORE:SC=0:KK=0:AA=0:NS=1:ND=0:
    PL=3:JJ=0:Q$="":GOSUB 1530:GOTO 110
1240 IF AG$<>"N" THEN 1220
1250 END
1260 REM *** NEW SHEET ***
1270 CLS:PRINT @140,"WELL DONE":PRINT @200,"SHEET"
    ;NS;"COMPLETED"
1280 NS=NS+1:PRINT @262,"GET READY FOR SHEET";NS
1290 FOR F=1 TO 4000:NEXT F
1300 RESTORE:AA=0:ND=0:TG$="G"
1310 OO=0:GOTO 110
1320 REM *** INSTRUCTIONS ***
1330 CLS:PRINT
1340 PRINT TAB(12)"dragman":PRINT:PRINT"  YOU 'C'
    TRAVEL INSIDE A MAZE  TRYING TO GOBBLE UP AS MANY
    DOTSAS YOU CAN."
1350 PRINT"  WHILST DOING THIS 3 GHOSTS    WANDER AROUND
    HOPING TO CATCH   YOU."
1360 PRINT"  IF ONE OF THEM CATCHES UP WITHYOU, YOU LOSE
    A LIFE.";
1370 PRINT"BUT IF YOU EAT A POWER PILL 'O' THEN FOR A
    LIMITED TIME YOU CAN CHASE THEM."
1380 PRINT:PRINT"     PRESS 'Z' TO CONTINUE.";
1390 ZC$=INKEY$:IF ZC$<>"Z" THEN 1390
1400 CLS:PRINT:PRINT"  WHEN YOU EAT A POWER PILL THE
    GHOSTS WILL CHANGE FROM A 'G' TO A 's'."
1410 PRINT"  IF YOU ENTER THE TUNNEL YOU   WILL APPEAR ON
    THE OPPOSITE     SIDE."
1420 PRINT"  THERE IS AN UNLIMITED NUMBER  OF SHEETS BUT
    EACH ONE IS HARDERTHAN THE PREVIOUS."
1430 PRINT"  IF YOU EXCEED 8000 POINTS YOU THEN RECEIVE
    AN EXTRA DRAGMAN."
1440 PRINT"  YOU USE THE CURSOR KEYS TO    MOVE THEN
    DRAGMAN."
1450 PRINT:PRINT"  PRESS 'Z' FOR SCORING TABLE";
1460 ZC$=INKEY$:IF ZC$<>"Z" THEN 1460
1470 CLS:PRINT:PRINT TAB(9)"scoring table":PRINT:PRINT
    TAB(9)"* =  10 POINTS":PRINT
1480 PRINT TAB(9);"O =  40 POINTS":PRINT
1490 PRINT"   s = 100 POINTS X SHEET NO."
1500 PRINT:PRINT:PRINT"  PRESS 'Z' TO START GAME....";
1510 ZC$=INKEY$:IF ZC$<>"Z" THEN 1510
1520 RETURN
1530 REM *** TYPE OF GAME ***
1540 CLS:PRINT:PRINT"1. ORDINARY":PRINT"2. FAST"
1550 PRINT:INPUT"ENTER TYPE OF GAME (1 OR 2)";TG
1560 IF TG<>1 AND TG<>2 THEN 1550
1570 IF TG=1 THEN POKE 65494,0 ELSE POKE 65495,0
1580 RETURN
```

Dragman
by Simon Green

Alpha Chase

on Spectrum

This program is a version of the game where the object is to steer an arrow around the screen, hitting each letter of the alphabet in turn. If you run into the edge of the screen or any letter out of turn then you lose one of three lives.

The game will run on either 16 or 48K machines. Although simple in design, after the first few levels it runs so quickly that it is in fact quite difficult to play.

Program notes

5	Set up the four arrows
10	Turn on caps lock, call print instructions
20-30	Set up variables
40-60	Print Display
100 160	Main loop, move player etc.
200 260	Check what hit, move up a level
300 390	Lose a life, restart game
400 500	Print instructions

```
ALPHA CHASE
© P VESSEY 1983
  5 RESTORE  FOR A=USR "A" TO
USR "D"+7  READ B  POKE A,B  NEX
T A  DATA 0,16,56,124,16,16,16,0
,0,8,12,126,12,8,0,0,0,16,16,16,
124,56,16,0,0,16,48,126,48,16,0,
0
  10 POKE 23658,8  GO SUB 400
  20 LET DIFF=0  LET LIVES=3
  30 LET CHR=65  LET A$="↑"
  40 BORDER 1  POKE 23693,8  CLS

  50 FOR A=0 TO 7 STEP 2  PLOT A
,A  DRAW 255-2*A,0  DRAW 0,175-2
*A  DRAW -255+2*A,0  DRAW 0,-175
+2*A  NEXT A
  60 PRINT #1,AT 0,0, INK 6, BRI
GHT 1,"LETTERS ",AT 0,22,"LIVES
",LIVES
  70 LET X=10  LET Y=15  LET X1=
-1  LET Y1=0
  75 DIM X(26)  DIM Y(26)
  80 GO SUB 150  FOR A=1 TO 20
BEEP .005,A  PRINT AT A,Y," "  N
EXT A  PRINT AT X,1,"

  90 PRINT AT X,Y, INK 5,A$  PRI
NT FLASH 1, INK 7,AT X(1),Y(1),"
A"  BEEP 1,40  BEEP 1,-20
 100 BEEP .01,0  PAUSE (11-DIFF)
  LET I$=INKEY$  LET X2=X  LET Y
2=Y  IF I$="5" OR I$="8" THEN LE
T Y1=(I$="8")-(I$="5")  LET X1=0
  LET A$=("←" AND I$="5")+("→" A
ND I$="8")
 110 IF I$="6" OR I$="7" THEN LE
T X1=(I$="6")-(I$="7")  LET Y1=0
  LET A$=("↑" AND I$="7")+("↓" A
ND I$="6")
 120 LET X=X+X1  LET Y=Y+Y1  IF
X<1 OR X>20 OR Y<1 OR Y>30 THEN
GO TO 310
 125 IF SCREEN$ (X,Y)<>" " THEN
GO SUB 200
 130 PRINT INK 5,AT X2,Y2," ",AT
X,Y,A$
 140 GO TO 100
 150 FOR B=0 TO DIFF*5  PRINT AT
INT (RND*18)+2,INT (RND*28)+2,"
*"  NEXT B  FOR A=65 TO 90
 160 LET R1=INT (RND*18)+2  LET
R2=INT (RND*28)+2
 170 IF R1=X OR R2=Y THEN GO TO
160
 180 PRINT INK 7,AT R1,R2,CHR$ A
  BEEP .01,A/2  LET X(A-64)=R1
LET Y(A-64)=R2
 190 NEXT A  RETURN
 200 IF SCREEN$ (X,Y)<>CHR$ CHR
THEN GO TO 300
 210 PRINT #1, INK 6, BRIGHT 1,A
T 1,0+(CHR-65),CHR$ CHR
 220 LET CHR=CHR+1  IF CHR<>91 T
HEN PRINT FLASH 1, INK 7,AT X(CH
R-64),Y(CHR-64),CHR$ CHR  RETURN
 230 PRINT INK 5,AT X2,Y2," ",AT
X,Y,A$  FOR A=0 TO 40  BEEP .01
,A  BEEP .01,40-A  NEXT A
 240 PRINT FLASH 1, PAPER 1,AT 9
,4,"** LEVEL ",DIFF/2+1," COMPLE
TED **"
 250 LET DIFF=DIFF+2  IF DIFF>10
THEN LET DIFF=0
 260 FOR A=0 TO 40  BEEP .01,A
BEEP .01,40-A  NEXT A  GO TO 30
 300 REM ** HIT ONE **
 310 PRINT INK 5,AT X2,Y2," ", P
APER 1, INK 6, FLASH 1,AT 0,10;"
LOSE A LIFE "
 320 FOR A=1 TO 20  PRINT INK 6,
PAPER 2,AT X,Y,SCREEN$ (X,Y)  B
EEP .02,-20  PRINT INK 2, PAPER
6,AT X,Y,SCREEN$ (X,Y)  BEEP .01
,20  NEXT A
 330 LET LIVES=LIVES-1  IF LIVES
>-1 THEN GO TO 30
 340 FOR A=0 TO 40  BEEP .01,A
BEEP .01,40-A  NEXT A
 350 PRINT FLASH 1, PAPER 1,AT 9
,6," G A M E   O V E R "
 360 PRINT INK 7,AT 11,4," PRESS
ANY KEY TO PLAY "
 370 IF INKEY$<>"" THEN GO TO 37
0
 380 IF INKEY$="" THEN GO TO 380
 390 GO TO 20
 400 BORDER 0  POKE 23693,6  CLS

 410 PRINT 'TAB 10,"ALPHA CHASE"
 420 PLOT 79,169  DRAW 90,0  DRA
W 0,-12  DRAW -90,0  DRAW 0,12
PLOT 77,171  DRAW 94,0  DRAW 0,-
16  DRAW -94,0  DRAW 0,16
 430 PRINT AT 4,0,"The object of
 the game is to    collect each
letter, alphabetic-ally, by runn
ing into each in   turn."
 440 PRINT "If you hit the bord
er, a mine orany letter out of s
equence, thenyou will lose 1 of
3 lives. The next letter in the
sequence willflash to indicate i
ts position."
 450 PRINT ' "Controls "
 460 PRINT 'TAB 2,"5 Left",'6
Down",TAB 2,"8 Right","7 Up"
 470 PRINT ' PAPER 1, INK 6, FLA
SH 1,AT 21,2,">> PRESS ANY KEY T
O PLAY <<"
 480 IF INKEY$<>"" THEN GO TO 48
0
 490 IF INKEY$="" THEN GO TO 490
 500 RETURN
GRAPHICS
↑=GRAPHIC A
→=GRAPHIC B
↓=GRAPHIC C
←=GRAPHIC D
```

Alpha Chase
by Patrick Vessey

Diamond Strikes Back

on BBC

This is another version of 'Space Invaders' which has been written for the BBC Model B. The object of the game is to shoot the diamond which drops down from the top of the screen. You man the space station at the bottom of the screen and the object is to shoot it as many times as possible in the set time (200 units). Instructions are included in the program listing.

Program notes

Lines	
10-50	The instructions
60	Set variables to 0
70-100	Define characters
240	The diamond
241	The missile
242	The space station
243	The destroyer sign
110	Get rid of the cursor
130-220	Movement of the diamond
230-370	Space station's movement
380-460	Fire missile and check for hit
470-500	Telling you that you've hit
510-540	Giving comments and ending (or starting again)

```
10MODE7:PRINTTAB(3,6)CHR$(141)"DIAMOND
  STRIKES BACK":PRINTTAB(3,7)CHR$
  (141)"DIAMOND STRIKES BACK"
20PRINT:PRINT:PRINT:PRINT
30PRINT"RIGHT":PRINT"LEFT":PRINT
40PRINT"       Z  FIRE":PRINT
50PRINT"PRESS A KEY TO BEGIN...";:
  Z$=GET$
60MODE4:Q=0:X=0:B=0:AA=0:QQ=0:Y=0:T=0:
  SC=0
70VDU 23,240,24,36,66,129,129,66,36,24
80VDU 23,241,24,24,24,24,24,60,90,153
90VDU 23,242,24,60,90,153,255,219,165,
  255
100VDU 23,243,170,85,170,85,170,85,170,
  85
110VDU 23;8202;0;0;0;
120 VDU 19,3,6,0,0,0,19,0,7,0,0,0
130FF%=RND(4):IF FF%=0THEN 130
140IF FF%=1THEN AA=AA+1:IF FF%=2 THEN
  AA=AA-1
150IF FF%=3THEN AA=AA+2:IF FF%=4 THEN
  AA=AA-2
160PRINTTAB(AA,QQ)CHR$240:SOUND 1,20,
  -15,1
170QQ=QQ+1
180PRINTTAB(X-1,B-1)"      "
190FOR SS=1TO200:NEXTSS
200X=AA:B=QQ
210IF AA<3 OR AA>35 THEN AA=10
220IF QQ>20 THEN QQ=0:AA=RND(20)
230A$=INKEY$(10)
240IF A$="."THEN Y=Y+1:SOUND 1,-14,25,2
250IFA$=","THEN Y=Y-1:SOUND 1,-14,25,2
260IF A$="Z"THEN SOUND 0,-14,40,2:
  PROCFIRE
265 IF Y<3 OR Y>33 THEN PRINTTAB
  (Y-2,20)" ":Y=10
270*FX 15,1
280 T=T+1
290 PRINTTAB(7,25)"TIME ";T
300 PRINTTAB(0,0)"
310 PRINTTAB(25,25)"SCORE ";SC
320 IF T>200 THEN GOTO510
330IF Y<2 OR Y>34 THEN Y=10
340PRINT TAB(Y,20)CHR$(242)
350PRINTTAB(Y-1,20)" "
360PRINTTAB(Y+1,20)" "
370GOTO130
380DEFPROCFIRE
390FOR F=19TO0 STEP-1
400PRINTTAB(Y,F)CHR$(241)
410PRINTTAB(Y,F+1)" "
420PRINTTAB(Y,F+2)" "
430IF Y=AA AND F=QQ THEN SC=SC+1
440IF Y=AA AND F=QQ THEN PROCHIT
450NEXT F
460ENDPROC
470DEFPROCHIT
480PRINTTAB(Y,F-1)CHR$(243):PRINTTAB
  (Y,F+1)CHR$243:PRINTTAB(Y+1,F+1)CHR
  $243:PRINTTAB(Y-1,F+1)CHR$243:PRINT
  TAB(Y-1,F)CHR$243:PRINTTAB(Y+1,F)
  CHR$243:PRINTTAB(Y-1,F-1)CHR$243:
  PRINTTAB(Y+1,F-1)CHR$243
490FOR H=100TO150:SOUND 1,-15,H,2:SOUND
  0,-15,H-50,1:NEXTH:CLS:A$=" "
500ENDPROC
510 IF SC<15 THEN PRINT"PATHETIC !!!"
515 IF SC = 15 THEN PRINT"BORDER LINE"
520 IF SC>15 THEN PRINT" GOOD"
525 IF SC >= 30 THEN PRINT"PROBABLY THE
  BEST SCORE IN THE WORLD"
530 INPUT"ANOTHER GAME ",A$
540 IF A$="Y" THEN GOTO10 ELSE CLS:END
```

Diamond Strikes Back
by H Auermuir

Piano

on Vic20

This program works just like the Vic piano program in the Vic user manual except it also draws a staff on the screen and pokes the notes on it as you play. The program is very simple to use and can be a great help for young or old students who are taking their first steps on the musical path.

Keys 1-8 work like piano keys but key 9 silences the *Vic* and clears the staff of notes.

You can change to another voice by altering the voice number in lines 65 and 230. Do not reassign the variable D in lines 140-210 to change octaves because the screen poke is based on this variable. For example, if you intended to convert a G to a C you would still get a G on the screen.

Program notes

Lines	
10-50	Sets up the display
60-100	Pokes notes on screen
100-310	Reads the keyboard — sound routine

```
0 REM ****************
1 REM *   (C)1982    *
2 REM *B-K BIRGISSON*
4 REM *   ICELAND    *
5 REM ****************
6 REM
10 PRINT"" "
20 POKE36879 8
30 FORN=1TO5
40 PRINT"------------------
50 NEXT
54 REM **************
55 REM * DRAW NOTES *
56 REM **************
60 IFP>21THENP=0 GOTO10
65 GETA IFA=0THENPOKE36878 8
66 IFA=0THEN65
70 X=7966-(A*22)+P
80 POKEX 81 POKEX+30720 7
90 IFX>7988+21THENPOKEX-22 72 POKEX-22+30720 3
100 IFX<7900+21THENPOKEX+22 71 POKEX+22+30720 3
105 REM *********
110 REM * SOUND *
120 REM *********
130 POKE36878 15
140 IFA=1THEND=135
150 IFA=2THEND=147
160 IFA=3THEND=159
170 IFA=4THEND=163
180 IFA=5THEND=175
190 IFA=6THEND=183
200 IFA=7THEND=191
210 IFA=8THEND=195
220 IFA=9THENPOKE36878 0 P=0 GOTO10
230 POKE36876 D
300 D=0 A=0 P=P+2
310 GOTO60
```

Piano
by B Bugisson

Mole Attack

on ZX81

This is a fast moving game for the 16K machine. In your garden there are 80 moles. You must rid your garden of moles but you only get one shot at each mole. There are nine mole holes in the garden and the moles will appear out of which ever one they want! Above each hole there is a hammer and above the hammers are the numbers 1—9

Once a mole appears you have a couple of seconds in which to hit the button on the key pad that corresponds with the number above that hole

Scoring

Scoring is as follows

- 10 points for each one of the first 80 moles hit
- 20 points for each of the final 20 moles hit
- − 5 points for each wrong key pressed on the first 60 moles
- −10 points for each wrong key pressed on the final 20 moles

To change the speed of the game you may change the pause in line 325

Program notes

Line	function
20 140	Setting up variables
150-260	Setting up screen display
265-360	Main game
370 390	Checks if you have hit a mole or not
500-570	Hitting mole routine
600-620	Printing score at the end of a game
631 637	Determines whether you deserve a replay or not
640-799	Do you wish to play again? routine

NB DO NOT ALTER ANY OF THE FIRST 5 LINES

```
   1 LET HS=0
   2 POKE 16418,0
   3 PRINT AT 22,0,[redacted]
   4 POKE 16418,2
   5 POKE 165  ,0
   6 POKE 16551+66,163
  10 PRINT AT 11,10,"READY ?"
  16 LET L=RND**INT (RND*10)**RN
D+23+RND-6**RND
  17 PRINT AT 11,13,
  20 LET S=0
  30 DIM A(3)
  40 LET A(1)=5
  50 LET A(2)=13
  60 LET A(3)=21
  70 DIM B(3)
  80 FOR F=1 TO 3
  90 LET B(F)=A(F)-3
 100 NEXT F
 110 DIM C(3)
 120 LET C(1)=6
 130 LET C(2)=15
 140 LET C(3)=25
 150 FOR F=1 TO 3
 160 PRINT AT A(F),0,[redacted]
 170 NEXT F
 180 FOR F=1 TO 3
 190 FOR N=1 TO 3
 200 PRINT AT A(F),C(N)
 210 PRINT AT B(F),C(N)
 220 NEXT N
 230 NEXT F
 240 PRINT AT B(1)-3,0              1
         2         3
 250 PRINT AT B(2)-3,0              4
         5         6
 260 PRINT AT B(3)-3,0              7
         8         9
 265 FOR T=1 TO 60
 270 LET F=INT (RND*4)
 280 LET N=INT (RND*4)
 290 IF F=0 OR N=0 THEN GOTO 270
 300 PRINT AT A(F)-1,C(N)
 320 PRINT AT 0,0,"YOUR SCORE
",S,"HIGH SCORE ",HS
 325 PAUSE 40
 330 LET A$=INKEY$
 331 IF T>60 AND A$<>"" THEN GOS
UB 370
 340 IF A$<>"" THEN GOSUB 370
 350 PRINT AT A(F)-1,C(N),"
 360 NEXT T
 365 GOTO 600
 370 IF (A$="1" AND (F=1 AND N=1
)) OR (A$="2" AND (F=1 AND N=2))
 OR (A$="3" AND (F=1 AND N=3)) O
R (A$="4" AND (F=2 AND N=1)) THE
N GOTO 500
 380 IF (A$="5" AND (F=2 AND N=2
)) OR (A$="6" AND (F=2 AND N=3))
 OR (A$="7" AND (F=3 AND N=1)) O
R (A$="8" AND (F=3 AND N=2)) OR
(A$="9" AND (F=3 AND N=3)) THEN
GOTO 500
 390 IF S>0 THEN LET S=S-5
 400 RETURN
 500 PRINT AT B(F),C(N)
 510 PRINT AT B(F)+1,C(N)
 520 PRINT AT B(F)+2,C(N),
 530 LET L=RND**RND**RND**RND
 540 PRINT AT B(F),C(N)
 550 PRINT AT B(F)+1,C(N)
 560 LET S=S+10
 570 RETURN
 600 FOR T=0 TO 10
 610 PRINT AT 11,10,"YOU SCORED
",S AT 12,5,"THATS A NEW HIGH
SCORE" AND S>HS)
 615 IF S>HS THEN LET HS=S
 620 NEXT T
 630 CLS
 631 IF S<900 THEN GOTO 648
 632 FOR T=1 TO 10
 633 PRINT AT 11,0,"YOU NOW HAVE
A REPLAY
 634 PRINT AT 11,21,[redacted]
 635 NEXT T
 636 CLS
 637 GOTO 265
 640 PRINT AT 11,6,"ANOTHER GO ?
(Y/N)
 650 IF INKEY$="" THEN GOTO 650
 660 IF INKEY$="N" THEN NEW
 670 IF INKEY$="Y" THEN GOTO 690
 680 GOTO 650
 690 PRINT AT 11 5,
 700 GOTO 3
```

DO NOT ALTER ANY OF THE FIRST 6 LINES

Mole Attack
by Ray Pennington

Screen movement

on Vic20

This is a program for the unexpanded Vic and was found by mistake. I was typing in a program and instead of typing 36879 for colour I typed 36897 and found that the screen of my Vic moved. So I poked around and wrote this program

Program notes

10 50	Rems
60 110	Controls for the program
120	Normal co-ordinates for screen
130-170	Input and decode movements
180-190	Move screen routine
220 240	End and restore screen to normal

```
10 REM %%%%%%%%%%%%%%%%%%%%%%%%
20 REM %%% SCREEN MOVEMENT %%%
30 REM %%%        BY       %%%
40 REM %%%   SEAN MARSH    %%%
50 REM %%%%%%%%%%%%%%%%%%%%%%%%
60 PRINT "PRESS: "
70 PRINT "U=UP"
80 PRINT "D=DOWN"
90 PRINT "L=LEFT"
100 PRINT "R=RIGHT"
110 PRINT "*=STOP "
120 U%=38:L%=12
130 GET A$:IF A$="" THEN 130
140 IF A$="U" THEN U%=U%-1
150 IF A$="D" THEN U%=U%+1
160 IF A$="L" THEN L%=L%-1
170 IF A$="R" THEN L%=L%+1
180 POKE 36897,U%
190 POKE 36864,L%
200 IF A$="*" THEN 220
210 GOTO 130
220 POKE 36897,38:POKE36864,12
230 PRINT "       O.K. BYE    "
240 END
```

Screen Movement
by Sean Marsh

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Tape Space

on Spectrum

The function of this routine is to find the first empty space on a cassette and automatically *Save* data or an array at that point. It is intended for the Spectrum 16K or 48K versions.

This routine is suitable for adding to any program which permits the *Saving* of data and greatly facilitates the construction of a data tape. I have not found the alternatives, such as *Loading* the last item on the tape then using *New* prior to *Loading* the main program, or counting the items while running through the tape, very satisfactory. This routine automates the whole process.

As an example, I have made the enclosed sample routine suitable for adding to the Horizon character program which is supplied with the Spectrum. It can be added either to the original program or to the program plus the mirror graphics routine featured in *PCW* 12-18 May. Although I have not tried it with a 16K version, I foresee no difficulty in it fitting.

Alterations to the Horizon program have been made in order to fit the addition into the space available. Lines 7065 and 7066 have been joined together and a new 7066 added. The former line 7070 has been made 7080. 9010 has been changed so as to place the new machine code in front of the existing code. 9100 is changed so as to put *Ramtop* before the new machine code. All these changes appear on the printout.

The operation of the routine is fully explained within the program. Some points of interest follow. The user enters the file name of the last file already on the tape. The routine reads all the headers and matches them with the name which was entered. When it finds a match, it makes the value of address 23320 100 and line 7072 causes a jump to the *Save* routine starting at 7076. The *Pause* at line 7076 causes the routine to wait until the cassette recorder has reached the end of the file.

In the absence of accurate information as to the number of bytes per second delivered by the tape, I came upon the parameter of *Pause* by trial and error. The time needed is one second for the space between the header and the program, three seconds for the leader of the program, one second or so for a suitable gap before *Saving* starts, and the actual length of the program.

Given an accurate value for the baud rate, it will be possible to compute an exact figure from the program length which is to be found at *Peek* 23307 +256**Peek* 23308.

If this routine is to be adapted for another program, instead of *Gosub* 6200 substitute *Cls*. The line numbers should of course be changed as required by the new program. Line 7080 must of course be adapted for the particular data or array it is wished to *Save*.

The machine code routine can be located in any suitable position and the location chosen will of course dictate the values used in lines 9010 and 9100. The machine code can be entered and *Saved* as in this example, or it can be included in a *Data* statement within the main program. (This would not be suitable in the Horizon program since it already uses a *Data* statement which could cause complications.)

To enter the routine as listed, first enter as a direct command *Clear* 32221 and *Enter*, then enter the routine at section 4 of the printout, and enter the numbers in section 2. Then enter the additions and alterations as in section 1, remember to remove the loading routine from lines 10 to 45, type *Goto* 9000 and the rest is automatic.

Section 1

```
7065 GO SUB 6200: PRINT "Enter the file name of the code to be saved": INPUT LINE f$
7066 DIM l$(1,10): PRINT '"Enter name""of last file on tape.""(""ENTER"" if tape is blank)": INPUT LINE l$(1)
7067 IF l$(1,1)=" " THEN GO TO 7080
7068 FOR f=23309 TO 23318: POKE f,CODE l$(1,f-23308): NEXT f
7069 GO SUB 6200: PRINT "Select ""Playback""""and run tape from start": POKE 23320,0
7070 RANDOMIZE USR 32222
7072 IF PEEK 23320<>0 THEN GO TO 7076
7074 GO TO 7069
7076 PAUSE 250
7077 GO SUB 6200
7078 PRINT FLASH 1;"STOP TAPE" ' FLASH 0;"SELECT ""RECORD"""
7080 SAVE f$CODE b,l
9010 SAVE " "CODE 32222,334: STOP
9100 CLEAR 32221: LOAD ""CODE
```

Section 2

```
 55  62   0 221  33   0  91  17
 13   0 205  86   5   6  10  33
 13  91  17   1  91  26 190 192
 19  35  16 249  33  24  91  54
100 201
```

Section 3

```
7DDE 37          SCF
7DDF 3E 00       LD   A,00
7DE1 DD 21 00 5B LD   IX,5B00
7DE5 11 0D 00    LD   DE,000D
7DE8 CD 56 05    CALL 0556
7DEB 06 0A       LD   B,0A
7DED 21 0D 5B    LD   HL,5B0D
7DF0 11 01 5B    LD   DE,5B01
7DF3 1A          LD   A,(DE)
7DF4 BE          CP   (HL)
7DF5 C0          RET  NZ
7DF6 13          INC  DE
7DF7 23          INC  HL
7DF8 10 F9       DJNZ 7DF3
7DFA 21 18 5B    LD   HL,5B18
7DFD 36 64       LD   (HL),64
7DFF C9          RET
```

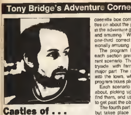
Section 4

```
10 FOR f=32222 TO 32255
20 INPUT i
30 POKE f,i
40 PRINT PEEK f:NEXT f
45 STOP
```

Tape Space
by Michael Kirkland


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Castles of . . .

Along the rain-lashed forest road comes the black coach The four terrified horses are whipped by a black caped coachman, and the whites of their eyes shine in the fitful moonlight

The coach rounds a bend and, by the shocking glare of a flash of lightning the haunted hulk of a dark castle is glimpsed on a tree-shrouded hill in the distance *(Oh get on with it, Bridge! Ed)*

Sorry about that! For some reason, we've had a lot of "*Castle of* adventures lately, so I thought we'd compare them. They're all for the Spectrum, and the first one out of the bag is *Castle of Death* (from Electra Software and for the expanded Spectrum) This one loads in two parts so the screen must be watched intently B Stengroom the author has written a scenario which concerns your struggle to negotiate the maze-like grounds of the eponymous edifice

After the instructions you are invited to *hit Enter* — but don't take this literally you would do better to *press Enter!* The program then tells you that unlike many other adventures the idear (*sic*, I'm afraid!) of this game is not to work out how to phrase your command The commands are then listed for you but you'd better write them down as they are not repeated

You start on a dirty path with exits North and West There are *no* objects here so press (or *Hit!*) N to go North, and the computer goes to sleep until you press another key Thus every move takes at least two key depressions

As in most adventures you should make a map of your wanderings — there are several objects lying around always it seems, in the same position However at any moment you may slip and smash your skull, which proves fatal This seems purely random, which is a little unfair

I haven't, so far managed to get to the castle But though things may hot up a bit inside I'm afraid that the mechanics of the game along with the sheer randomness of fatal accidents did nothing to endear me to the *Castle of Death*

Down the road a few miles we come to the *Castle of Doom* The architects of this delightful little residence are Specsoft The program comes on a tape with a bonus of an arcade game *Missile Command* The cassette box contains a blurb which prattles on about the program being a winner in the adventure game field Highly original and amusing Well Specsoft are at least one-third correct — the game is occasionally amusing

The program is loaded in four parts each section presenting you with a different scenario The first stage is the countryside with farmyard scenes playing a major part The second stage takes you into the town while the third part of the program takes place in the mountains

Each scenario requires you to wander about, picking up various objects as you find them, and using them wisely in order to get past the obstacles that you meet

The fourth part follows the same pattern, but takes place in the castle

I found the map-making enjoyable, but ultimately the game palled — not least because there is no point to the proceedings After many happy hours of wandering around I was finally asked to give the correct answer to a weedy riddle *Peeking* at the listing took care of that!

On without pause for breath to *Magic Castle* from Gilsoft, "for any 48K Spectrum This time it is a Princess who is imprisoned in the castle and it's your job to rescue her Again the instructions are all in the program but unfortunately the only way to get back to these once you've started playing is by *Quitting*

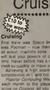
Like the others in this survey *Magic Castle* is a text adventure This follows the traditional adventure rather closely with the obligatory maze near the start (represented by a minefield and an impenetrable forest) a torch that has to be lit, and all the other paraphernalia I liked this one even though the keys didn't respond very quickly to being *Hit*

Not much room left this week just enough to reply to letters I've had from some of you regarding *The Valley* (you may have seen in the past couple of weeks the news stories about discussions between Kayde and ASP concerning this program) Henry Budgett of ASP kindly let me have a copy of his *Valley* and I hope to have a report on it soon

Finally, if any of you are currently playing *The Knight's Quest*, from Phipps Associates remember *The microdrive is not, repeat not, the object of this Knight's quest!* ■

This series of articles is designed for novice and experienced Adventurers alike Each week Tony Bridge will be looking at different Adventures and advising you on some of the problems and pitfalls you can expect to encounter So if you have an Adventure you want reviewed or if you are stuck in an Adventure and cannot progress any further write to Tony Bridge Adventure Corner *Popular Computing Weekly* Hobhouse Court, 19 Whitcomb Street, London WC2 7HF

Cruising & Blind Alley



Can you beat the new high score?

Cruising

First there was *Space Invaders* then there was *Pacman* — now there is *Cruising* This all action machine code arcade type game will test your powers of co-ordination to the limit Never before has a game asked you to think so quickly or move so fast

Achieving a high score on *Cruising* takes considerable skill and not a little patience

Popular Computing Weekly is offering £10 each month to the player with the highest score on *Cruising* All you have to do to enter this month's competition is send a print-out of your highest score together with your name and address to

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Each month we will publish the name of the winner and the new *Cruising* high score Are you good enough to accept the *Cruising* challenge?

The winner of last month's competition with a score of 27678 was C Moore of Patchway Bristol who receives £10 Entries for this month's competition close on July 31

Notes

1) Each entry must consist of a ZX printout and your name and address
2) Closing date for this month's *Cruising* challenge entries is July 31
3) The highest score each month will receive £10
4) High scores can't be transferred from one month to another
5) The judges decision is final
6) No employees of Sunshine Publications Ltd or their families will be eligible to enter

Blind Alley

Blind Alley is a game of strategy In order to win you must outwit the computer using your craft to fence in and finally destroy the enemy pursuit vehicles But watch out for the solid trail left by your opponents one touch is fatal!

Each month *Popular Computing Weekly* is giving away £10 to the player with the highest score on *Blind Alley* To enter this month's competition simply send in a copy of your score and the code at the bottom of the score table together with your name and address to

Popular Computing Weekly
Blind Alley
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The winner of last month's competition with a score of 70625 was Stuart Williamson of Bradford West Yorks Entries for this month's competition close on July 31



ZX81 LISTINGS

Kevin Palmer of Hamble Court, Bodycoats Road, Chandlers Ford, Hants, writes

Q I am writing to ask if it is possible to give me some information or listings that would help me become accustomed to machine code on my ZX81. It is unexpanded, but I have access to a 16K Ram pack. Also, I would be very interested to know where the nearest ZX club is to me.

A We do not have any specific listings to help you, though you will undoubtedly glean some information from working through any of the machine code listings published in *Popular Computing Weekly*

Perhaps your best bet would be to purchase one of the many books on machine code Two books that can be recommended are *Machine Code and better Basic* by Ian Stewart and Robin Jones (Shiva — £7 50) and *Mastering Machine Code on your ZX81* by Tom Baker (Interface — £7 50)

As to your nearest ZX club, according to my map you are halfway between Winchester and Southampton Unfortunately, I could not find any clubs in that region I can only suggest that you try a trip to your local library — if they do not know of any clubs, they might be willing to help you start one

BASIC NONSENSE!

D Moore of Abridge Close, Redcar, Cleveland writes

Q I was recently looking through *Popular Computing Weekly* for 14-21 April and I noticed a line 0 in the Defender program. I tried to put this into my Spectrum, but all I got was the report code '*C Nonsense in Basic*'. Is there anyway that I can *Poke* in a line 0?

A The procedure for this is the same with both the ZX81 and the Spectrum — it involves *Poking* the systems variable *Prog* All you need to do is look up the address and *Poke* it with nought You then *Poke* the address plus one. So it is

```
POKE 23635,0
POKE 23636 + 1,0
```

QUALITY CASSETTES

David Brown of Trewllard, nr Penzance Cornwall writes

Q I wonder if you could tell me if computer quality cassettes are better than normal ones. Also, is Binatone bringing out a £50 computer that has colour and sound. They wrote a letter to my school about it months ago, and it is now well past launching date

A Computer quality cassettes are better because they are shorter and should have a better magnetic coating One thing that causes problems when using a cassette is that the longer the tape, the more work the motor has to do to keep the tape running evenly This in turn, makes it more likely that a fluctuation will cause a crash

Thank you for your note about Binatone writing to schools, it is something that I did not know about In all honesty, with new computers coming on to the market all the time, the Binatone has had a remarkable track record of engendering interest, without any sign of the product actually coming into the market place

CRASHING PROBLEM

Martin Richards of The Green, Urchfont, nr Devizes writes

Q I have a most tormenting problem When I input *Poke 65495,0* or some other sort of *Poke*, the computer crashes completely So, I press the *Reset* button, but even then if I put in just *Enter* it comes up with *?SN Error*.

It is most frustrating, as I cannot speed up my games, and all the programs in magazines seem to contain this *Poke* I still have my guarantee. Is it worth giving up or renewing? I forgot to mention, my computer is a Dragon

A This problem arises from the fact that different batches of the *Motorola* chip seem to have been made to different standards It must be said that all the Motorola chips used in the Dragon do meet the published specification Some of them exceed it This *Poke* can only be used on those chips which *exceed* that specification, since it has the effect of doubling the speed of the chip, which it was not designed for

As far as I know there is no way of telling from the outside what sort of chip you have inside other than the fact that it will meet the basic specification Neither is there to my knowledge, a list of which addresses cause problems if *Poked* in this way What must be said, is that you seem to say from your letter, that *every Poke* gives this effect, when in fact it should only happen on relatively few addresses If your system crashes on *any* address you *Poke*, then there is probably a fault, and it should be returned under the guarantee

WHAT IS FORTH-79?

David Tattnall of Bournemouth Avenue Euston writes

Q I am thinking of trying to learn another computer language than Basic, namely Forth However, I know very little about it, though I am waiting for a couple of books to come through the library.

One thing I would like to know, for a start, is what is Forth-79? Is it the language as designed in 1979? And is Fig Forth the same? Also, which does the Jupiter Ace use, if the two are different, and is *Rpn* Reverse Polish Notation?

A Forth was developed by Charles Moore in the late 60s and early 70s This lead to the setting up of the Forth Interest Group (FIG) who developed a standard version of the language However, this was one of several so a Forth standards team was formed — in 1980 they came up with Forth-79 There is still a lot of argument between the two as to which is best

The Ace uses a modified form of Forth 79 — again there are arguments as to which is better If you are new to Forth and you start with the Ace, there should be no problems until you try and use another standard If you are used to Forth-79, you might find some of the omissions on the Ace annoying on the other hand some of the extras can turn out to be very useful

Rpn is Reverse Polish Notation, as used in all the implications of Forth

SPECTRUM UP-GRADE

R H Crawshaw of Asket Drive Leeds writes

Q Can you give me some information on the upgrade kit for the 16K Spectrum as offered by Fox Electronics I would particularly like to know

a) Would my guarantee from Sinclair be invalidated?

b) Would the kit make my Spectrum fully equivalent to a normal 48K Spectrum?

c) Is it possible for a complete amateur to fit the kit?

A Yes, to all three queries If you use a non-Sinclair upgrade, then your guarantee will be invalidated The kit does give your Spectrum 48K

Fox will also send you advice on tuning your Spectrum to your television All you have to do with the upgrade is put the chips into the sockets — details of which chips go where are provided

Is there anything about your computer you don't understand, and which everyone else seems to take for granted? Whatever your problem *Peek* it to Ian Beardsmore and every week he will *Poke* back as many answers as he can. The address is *Peek & Poke, PCW,* Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.



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Commodores for sale

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VIC20 + cassette unit + dust cover and books £95 Tel 061 4878442

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VIC20, + cassette also super expander 6 games cartridges + more than £70 of software joystick, introduction to Basic 1 4 books and some magazines only £235 ono Tel Great Harwood 0254 885333

VIC20 cartridges for sale open to offers Tel 0442 58200

VIC20, cassette deck + 16K expander introduction to Basic parts 1 and 2 + software £180 Tel Sheffield 662156

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VIC20 (unexpanded) + books, £75 ono Tel 0302 8407be

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ACOUSTIC MODERN 4010 as new £70 ono Tel 0403 731650 after 6 pm

For sale

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48K APPLE II £425 ono Tel Bookham 53874 after 7 pm

GENIE I (16K) integral cassette + EG 101 12in screen presspher monitor under guarantee Any reasonable offer Tel Roberts Bournemouth (02027) 292716

ATARI VCS CARTRIDGES Dragster £6 Outlaw Basketball Surround Space War Blackjack £8 each Bowling Street Racer Video Olympics Circus Maze Craze £10 each Tel 01-669 7590 after 5 pm

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BACK ISSUES of computer magazines for sale including PCN Personal Computer World Your Computer Sinclair Programs, Sinclair User Practical Computing PCT and others offers ring for details 01 649 0225

LYNX, 2 weeks old as new £200 or swap for Dragon 32 Tel Richmond, North Yorks 832210 4 30 pm to 6 pm

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ZENTRONX 730 PRINTER, 80 or 132 column 100 CPS £100 ono Tel Ipswich 50836

SEIKOSHA GP100A PRINTER adapted for Vic 20 computer + paper £200 two months old Tel Cardiff 586752

SEIKOSHA GP100A, 4 months old £115 ono BBC cable £7.50 Hemel Hempstead 48141 (6 pm)

TEXAS TI 99/4A unwanted xmas present dual recorder leads 4 cassette games Munch Man module Speech Editor module £130 Tel 0302 723671 (daytime only)

SPECTRUM FLOW-CHART help plan programs, follow programs other than list. This program gives you an accurate flow chart of basic Spectrum programs £1.70 4 Willesden Road Cefu-Glas Bridgend S Wales.

DIABLO 2.5 meg hard disc and power supply Pertech 7 track tape deck, Texas silent type printer No reasonable offer refused. Tel 0422 843348 evenings only

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INTELLIVISION CARTRIDGES includes Lock n Chase Star Strike Sea Battle Golf etc, £11 each Tel 0908-737224

SWAP my Sharps Carousel Microwave oven with cookery books for Dragon 32 or Spectrum Mrs P A Hudson Crayke House Cottage Muston Filey YO14 0ED

VIC20 Jelly Monsters, £13. Tel Stafford 663168

Wanted

ZX SPECTRUM with software up to £80 Tel 01 688 0673

DISC DRIVE for the Vic20 around £150 also Trackball suitable Atari Vic20 around £30 Tel 01-840 3610

COMPILER REQUIRED for Spectrum must be original with manual will offer some of my original tapes or my Hempstem joystick if other software accompanies compiler Tel Rayleigh (0268) 779045 ask for Ray

WANTED in good condition Dragon 32 Spectrum 48K Vic64 or BBC model B Tel Hemel Hempstead 68588

WANTED Commodore 8K Ram pack Tel 0442 58200

NEW RELEASES

TROOPS



Virgin Games has issued its first batch of games for the Spectrum, Vic and BBC micros

The pricing of the games is interesting, in that they cost £7 95 each Whilst this is fairly cheap for the BBC it is decidedly expensive for the Spectrum — Virgin must be confident

The first Spectrum releases contain some surprisingly conventional games *Golf* and *Sheepwalk* for example *Yomp* you may remember, was the name given to the mode of travel adopted by the British troops across the Falklands — it is also the title of another of the Virgin releases

You must command the Paras and guide your platoon across a busy enemy highway containing two lanes of traffic, which will run you over if hang on I've heard this before somewhere

If you succeed in getting three troops across the motorway you can activate your radar scanner and direct your men across a minefield Naturally this involves not bumping into things or alerting the sentry — if you make it your platoon gets three extra men

Program *Yomp*
Price *£7 95*
Micro *Spectrum 16/48K*
Supplier *Virgin Games*
61-63 Portobello Road
London W11 3DD

NOVICE

Cesil is a computer language that was specially developed to teach computer programming to novices — the letters stand for Computer Education in Schools Instruction Language The language is now available for the Spectrum on a cassette from Gilsoft

Cesil divides programming commands into three types Label, Instruction and Operand Label is the actual command word like *Loop* Instruction is the specific task like *Print* and the Operand is the actual data like *Hello*

This format is capable of handling more or less all that Basic can and is supposed to be a better grounding for other computer languages

The cassette comes with a 15 page instruction manual A ZX81 version is also available

Program *ZX Cesil*
Price *£5 95*
Micro *Spectrum*
Supplier *Gilsoft*
30 Hawthorn Road
Barry S Glamorgan
CF6 8LE

MINED!

Imagine has at last issued *Frantic* for the Vic20

The aim of the game is to excavate and mine Spectrum's moons and while you're at it kill off various aliens whose home you are presumably exploiting

You have a two-way radar, indicating the position of the aliens relative to you and a laser with which to dispatch them

Frantic was coded and designed by Eugene Evans who was featured in a number of articles in the national press and so is the closest to a programmer 'celebrity' the industry yet has

Porgram *Frantic*
Price *£5 50*
Micro *Vic20*
Supplier *Imagine Software*
Masons Buildings
Exchange Street East
Liverpool
Merseyside L2 3PN

MARTIAN

Programmer Gregory Trezise

Given the quality of the machine (and forgetting the price), it is surprising there are not more arcade style games for the BBC B Virgin has released three games for this machine as part of its move into the software market

Landfall requires you to pilot your spacecraft to a safe landing on Mars This is made difficult because you are running out of fuel Success involves juggling with your velocity to keep it low

The screen displays an instrument panel and a view from the cockpit window

Program *Landfall*
Price *£7 95*
Micro *BBC B*
Supplier *Virgin Games*
61-63 Portobello Road
London W11 3DD

MONSTERS

Protek is an Edinburgh based company that has moved into the ZX market At the recent microfair it unveiled its first few releases

Byter is a version of *Puckman* for the ZX81 The machine code program has all the appropriate trappings like power pills and monsters but unlike some other versions you are given a choice of skill levels

Program *Byter*
Price *£4 95*
Micro *ZX81 16K*
Supplier *Protek Computing*
Clydesdale Bank
Building
High Street
South Queensferry
Edinburgh EH30 9HW

COMMANDED

KayJay Electronic Services is a company that has previously specialised in hardware It has now moved into the home computer market with *DISMON* — a machine code monitor for the Dragon

The monitor gives all the usual functions through single letter entry There are 20 commands, including a full disassembler and a load and save option

Program *DISMON*
Price *£18 86*
Micro *Dragon 32*
Supplier *KayJay Electronic Services*
13 The Baulters
Gorleston
Great Yarmouth
NR31 6TF

ACCOUNTED

The spreadsheet is a common accounting tool that has been made available for a number of micros This now includes the 16K ZX81 following a new release from Myrmidon Software

Draft comprises a program and 12 page instruction booklet The program sets up a tabular worksheet into which is entered figures, formulae and text

A report generator allows you to display any three columns on the screen and list all the information the sheet is carrying — unlike the usual technique, which is to create a "text window" which you move over the sheet using cursor keys

Program *Draft*
Price *£7 50*
Micro *ZX81*
Supplier *Myrmidon Software*
PO Box 2
Tadworth
Surrey KT20 7LU

NEW RELEASES

T-TEST

Rainbow Research has a number of packages available for home micros, particularly for the BBC B.

Statistics is a scientific and educational package which includes all the most common statistical procedures including T-test, chi squared test, standard deviation, etc.

Program *Statistics*
Price *£6.00*
Micro *BBC B*
Supplier *Rainbow Research, 288 High Street, Ponders End, Enfield, Middlesex EN3 4HF*

X 3

Tape 9 from Remsoft contains three games featuring the sound capabilities of the Jupiter Ace.

Bomber is a version of the classic *Blitz* game in which you have to demolish buildings before you can land. *Bouncy* is a version of *Breakout*, while *Gorger* is claimed to be a truly original program.

Program *Tape 9*
Price *£5.50*
Micro *Ace*
Supplier *Remsoft, 18 George Street, Brighton BN2 1RH*

ODYSSEY

Astrodynamics seems to have been inspired by the film *2001*. Its *2002* is a program for the 32K BBC machine based on the space station docking sequence from Kubrick's famous film.

You guide your spaceship into dock with a 3D high-res representation of the double wheel space station using the six directional keyboard controls.

The instruction manual that comes with this program is sufficiently complex to make me think that this will not be a good game for those lacking in patience.

Program *2002*
Price *£6.95*
Micro *BBC 32K*
Supplier *Astrodynamics, 30 Canberra Road, Leyland, Lancs*

RESCUED!

Solar Soft is a new company in the BBC market. Its first release is *Zany Kong*, a version of the arcade game *Donkey Kong*.

The game requires 32K and will work on all the operating systems.

For the few people who have never heard of the game, it features a little man you must guide up a series of ladders. At the top of the ladders stands a giant monkey which is hurling things at you — your mission is to reach the top and rescue a girl from a fate worse than death.

Program *Zany Kong*
Price *£6.50*
Micro *BBC (32K)*
Supplier *Solar Soft, 5 Westmoreland Drive, Camberley, Surrey GU15 1EW*

the program's great, except for the one bug. - it always lets you lift Micros successfully

YOU ARE NEAR THE EXIT DO YOU WISH TO PROCEED NO ONE IS WATCHING YOU

by Steve Way

a Loser program

SHOPLIFTING.

CHINESE

Viscount Software's first release is *Character Generator* for the BBC.

The character set can be defined on an 8 by 8 grid. This means that, for example, you could make your BBC print in Arabic or Chinese.

The program features a number of other options like inversion and rotation of characters, as well as saving characters to tape for use in your own programs.

Program *Character Generator*
Price *£9.95*
Micro *BBC A or B*
Supplier *Viscount Services, Computer World, 24 Boulton Road, Southsea, Hants*

HIGH IQ

M.K. CIRCUITS

Micro IQ is an educational program for the Spectrum. It manages to squeeze 250 questions and 1,000 possible answers into the machine by dividing the test into nine separate parts which are loaded in sequence.

Although called *IQ*, the questions are about the history of computers and the Spectrum.

Your percentage score is given as you go along — the correct answer being one of four from which you must choose in a multiple choice format.

Program *Micro IQ*
Price *£5.00*
Micro *Spectrum 16/48K*
Supplier *MK Circuits, 63 Felstead Road, Grimsby, South Humberside*

JR!

ORIC-1 48K
DALLAS
STRATEGY GAMES

Cases Computer Simulations has a number of "tactics and strategy" type games available on the Oric and Spectrum.

Dallas for the 48K Oric is a business simulation taking oil as its theme. Like ruthless entrepreneur J R Ewing you must develop and exploit a number of oil fields until you have accumulated 280 million dollars in cash and assets.

The program gives you a menu of options like drilling and seismic survey. Various disasters can be expected like blow-outs, tornados and, worst of all, government tax increases.

A Spectrum version is also available.

Program *Dallas*
Price *£7.95*
Micro *Oric 48K*
Supplier *Cases Computer Simulations, 14 Langton Way, Blackheath, London SE3 7TL*

New Releases is designed to let people know what software is coming on to the market. If you have a new game or utility which you are about to release send a copy and accompanying details to New Releases, Popular Computing Weekly, 19 Whitcomb Street, London WC2 7HF



A question of interpretation

Last week I described a program to turn a decimal value into its binary equivalent

```
10 DIM WORD$ (15)
20 INPUT "Value",X
30 FOR I = 0 TO 15
40 WORD$(I) = CHR$(48 + FNBIT(X))
50 X = FNBODY(X) NEXT I
60 FOR I = 15 TO 0 STEP - 1
70 PRINT WORD$(I);
80 NEXT I PRINT
90 PRINT "BODY IS" X
1000 DEF FNBIT(X) = X - INT(X/2)*2
2000 DEF FNBODY(X) = INT(X/2)
```

The binary value is stored in successive elements of the character array *Word$*

If the value 65535 is entered then the binary equivalent is found to be 1111 1111 1111 1111 and the body is 0 When the value −1 is then tried the equivalent is also 1111 1111 1111 1111 but the body is −1 for this negative number. It is found for any negative number that the body is always negative

What is −3/2 in integer arithmetic? We can find out quite simply by *Print Int*(−3/2) which reveals that the answer is −2. Why?

Enter the value −3 in the program and you get the answer 1111 1111 1111 1101 Moving it all one place to the right produces 0111 1111 1111 1110 (the binary equivalent of 32766) This is not correct but perhaps as the body is −1 (ie X when all is finished) the result of moving to the right should be 1111 1111 1111 1110 (the binary equivalent of −2)?

That computers tend to use binary arithmetic (and the strange form we have discovered) is why we find that *Int*(1/2) = 0 but *Int*(− 1/2) = −1 (check the binary equivalents)

The *Int* operation (on most computers) rounds *down* because the last bits are lost The binary value 1111 1111 1111 1111 is what is termed the *two's complement* of the decimal value −1 and helps explain why on many computers the size of integer numbers varies from 32767 to −32768

Using the program with the decimal value 32767 produces 0111 1111 1111 1111 whereas −32768 produces 1000 0000 0000 0000 (which incidentally is also the value produced by 32768)

Comparing the two values gives the clue If there is a zero in the left-most bit then the number is treated as if it were positive if there is a one in the left-most bit. then the number is treated as if it were negative

If we perform the addition 32767 plus 1 in integer arithmetic (assuming two bytes) we either find that the result is −32768 (in Forth and in a very few Basics) or we find that there is an overflow error There is an overflow because we have added two positive numbers to produce a negative number Depending on how good the Basic interpreter is such errors are always picked up — some interpreters can be fooled with strange arrangements and it is possible for the interpreter to accept the sequence

$$20000 - 10000 + 20000$$

but not

$$20000 + 20000 - 10000$$

because in the second case 20000 + 20000 is 40000 and produces an overflow

The Acorn Atom has no error checks for the size of numbers and is an ideal machine on which to investigate computer arithmetic You do not have to construct the equivalent of a two-byte integer (note that the BBC and Atom have four byte integers) to investigate the vagaries (or what seem to be vagaries) of computer arithmetic It is very simple to illustrate computer arithmetic by the use of commands to store and fetch numbers from bytes (*Poke* and *Peek*)

On most microcomputers (ie not the BBC or Atom) to put the value *X* in the location *L*, we write *Poke L,X* — different computers have differing restrictions on the values that *X* can take

For a few computers no restrictions are placed on the value taken by *X* one byte has eight bits so it can take values from 0 to 255 Thus for these computers *X* is then turned into a value from 0 to 255 If *X* is 500 then the value 500 − 256 = 254 is stored in the byte

Many others will allow values from −255 to 255 — try +1 (ie *Poke L*, −1) to be followed by Print *Peek*(*L*) The value fetched by the *Peek* is 255 which as eight bits is 1111 1111 ■

Boris Allan

Puzzle

The case of the missing digits

Puzzle No 62

Professor Otto Hex was posing mind-boggling questions to his students again "It's just a matter of even numbers" he remarked plastering equations all over the blackboard

$\sqrt{\overline{E}} = E$
$\sqrt{\overline{EE}} = E$
$\sqrt{\overline{EEE}} = EE$
$\sqrt{\overline{EEEE}} = EE$
$\sqrt{\overline{EEEEE}} = EEE$
$\sqrt{\overline{EEEEEE}} = EEE$
$\sqrt{\overline{EEEEEEE}} = EE0E$
$\sqrt{\overline{EEEEEEEE}} = EEEE$

"In each of the above expressions the letter *E* indicates any even digit — 2 4 6 or 8 *E* never equals zero although there is one zero shown in the last but one equation

"Can you fill in the missing digits?" he demanded "Not a chance" they responded Can you?

Solution to Puzzle No 57

First we need to find all possible right angle triangles with integral sides, having a perimeter of 360 yards (The hypotenuse of such a triangle must lie between 360/2 and 360/3 yards)

Using the following program

```
10 FOR H = 360/3 TO 360/2 20 FOR S = 1 TO H - 1
30 LET T = SQR (H * H - S * S) 40 LET T = VAL
STR$ T 50 IF H + S + T = 360 THEN PRINT T
S H 60 NEXT S 70 NEXT H
```

The program reveals four such triangles with sets of sides (36 160 164) (60 144 156) (72,135 153) and (90 120 150) The relevant areas of each can be found by finding half the product of the first two figures in each set.

As we know that all the statements were false then Farmer Giles cannot live at Mayfield nor Farmer Stiles at Hilltop Farmer Miles does not live at Cowslip or at Hilltop (the farmyard with the longest side)

The only farm with any non-even sides is Dewdrop so this is where Farmer Wiles must live Thus, Farmer Miles must live at Mayfield Farmer Stiles at Cowslip and Farmer Giles at Hilltop

Winner of Puzzle No 57

The winner is Cliff Hicks Burdale Close Norton, Malton, N Yorks who receives £10

Top 10

Dragon

1	(1)	The King	(Microdeal)
2	(3)	Planet Invasion	(Microdeal)
3	(2)	Space War	(Microdeal)
4	(5)	Dragon Trek	(Salamander)
5	(—)	Defence	(Microdeal)
6	(4)	Katerpillar Attack	(Microdeal)
7	(9)	Chess	(Dragon Data)*
8	(7)	Grand Prix	(Salamander)
9	(—)	Computer Voice	(Dragon Data)
10	(—)	Dragon Quest	(Dragon Data)

*Cartridge

(Figures compiled by Boots & Co, London)

BBC*

1	(2)	Killer Gorilla	(Program Power)
2	(3)	Great Britain Limited	(Simon W Hessel)
3	(1)	Word Wise	(Computer Concepts)
4	(4)	Rocket Aets	(Acornsoft)
5	(—)	View	(Acornsoft)
6	(—)	Landfall	(Virgin Games)
7	(—)	Forth	(Asterdes)
8	(9)	Home Finance	(BBC)†
9	(—)	Moon Raider	(Program Power)
10	(8)	Inheritance	(Simon W Hessel)

*Model B only except where shown †Runs on Model A or B

(Figures compiled by Micro Management Ipswich 0473 59181)

Spectrum

1	(1)	Flight Simulation	(Psion)
2	(3)	Penetrator	(Melbourne House)
3	(4)	Transylvanian Tower	(Richard Shepherd)
4	(2)	Jet Pac	(Ultimate)
5	(5)	The Hobbit	(Melbourne House)*
6	(6)	3D Tanx	(DK Tronics)
7	(8)	Horace Goes Skiing	(Psion Melbourne House)
8	(7)	Ah Diddums	(Imagine)
9	(—)	Orbiter	(Silversoft)
10	(9)	Arcadia	(Imagine)

*Requires 48K

(Figures compiled by W H Smith and Son Ltd)

ZX81*

1	(1)	3D Monster Maze	(New Generation)
2	(2)	Flight Simulation	(Psion)
3	(4)	QS Scramble	(Quicksilva)
4	(7)	Alien Dropout	(Silversoft)
5	(5)	Galaxians	(Artic)
6	(3)	Chess	(Psion)
7	(8)	15 Games for 1K	(J K Greye)†
8	(—)	Asteroids	(Asteroids)
9	(6)	Avenger	(Abacus)
10	(—)	Night Gunner	(Digital Integration)

*All 16K except where shown †Runs in 1K

(Figures compiled by W H Smith and Son Ltd)

Atari

1	(4)	Escape from Perilous	(English Software)
2	(1)	Zaxxon	(Datasoft)
3	(—)	Stone of Sisyphus	(Adventure International)‡
4	(—)	Xenon Raid	(English Software)
5	(3)	Tanx Warp	(English Software)
6	(6)	Preppie 2	(Adventure International)
7	(—)	Air Strike	(English Software)
8	(—)	Pharaoh's Curse	(Synapse)†
9	(8)	Castle Wolfenstein	(Muse)‡
10	(—)	Defender	(Atari)

†32K cassette ‡32K disc §48K disc

(Figures compiled by Calisto Computers, Birmingham 021-632 6458)

Books

1	(1)	Vic Programmer's Reference Guide *Commodore*	(Commodore)
2	(4)	Assembly Language Programming for the BBC Micro, *Birnbaum*	(Macmillan)
3	(8)	Enter the Dragon *Carter*	(Melbourne House)
4	(7)	Spectrum Hardware Manual *Dickens*	(Melbourne House)
5	(—)	Programming the BBC Micro *Williams*	(Newnes)
6	(6)	Spectrum Rom Disassembly *Logan*	(Melbourne House)
7	(9)	6502 Machine-code For Beginners, *Stephenson*	(Newnes)
8	(5)	6809 Assembly Language Programming, *Leventhal*	(Osborne)
9	(10)	Dynamic Games for Your Dragon, *Hartnell*	(Interface)
10	(3)	Commodore 64 Programmer's Reference Guide *Commodore*	(Commodore)

(Figures compiled by Watford Technical Books, Watford 0923 23024)

Vic20

1	(1)	Panic	(Bug-Byte)
2	(5)	Arcadia	(Imagine)
3	(4)	Cosmiads	(Bug-Byte)
4	(3)	Wacky Waiters	(Imagine)
5	(6)	Catcha Snatcha	(Imagine)
6	(7)	Amok	(Audiogenic)
7	(9)	Asteroids	(Bug-Byte)
8	(—)	Blitz	(Commodore)
9	(—)	Introduction to Basic Pt 1	(Commodore)
10	(—)	Choplifter	(Audiogenic)

(Figures compiled by Boots & Co London)

(Last week's position in brackets)

PiMan awarded a Knighthood

The home-micro-world is still in a state of hangover, following the celebrations marking the Knighthood recently bestowed on the PiMan. In the latest Honours List "Sir" PiMan was commended for 'spreading joy and happiness across the planet,' with his cult adventure quest PIMANIA!' But our ace reporter, Ivor Duff-Sinclair, has discovered a sinister political motive behind the PiMan's elevation to the House of Lords.

The Hideous Truth

During the recent election campaign the entire Labour Party spent all of their time palying "PIMANIA, the best adventure game ever reviewed" and consequently lost their marbles. The SDP / Liberal Alliance unfortunately couldn't get any programs to load. But amazingly, the whole Conservative Party dedicated their campaign to palying the PiMan's new game "AUTOMONOPOLI", recognised as the best version available of this classic game, where you can play a dinamic challenge against your own computer! The PiMan's Knighthood is a blatant reward for these services. Several leaders of British political parties have now announced their resignations so that they can devote the rest of their lives to revalling in the wonderful software produced by . AUTOMATA,"WE PUT SOME TING IN COMPUTING"

DEAR AUTOMATA DESPITE YOUR VERY SILLY ADVERTISING I AM ORDERING THE FOLLOWING COMPUTER SOFTWARE FROM YOU

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PIMANIA	(Dragon 32) £10 00p	
PIMANIA	(BBC Micro 1 B) £10 00p	
PIMANIA	(ZX81 16K) £5 00p	

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DESPATCH NUMBER



Since the launch of PIMANIA nine months ago, there have been several imitations of this brilliantly original program. Some 'prize games' were launched, and never heard of again, some were won within 72 hours, and some others were a load of old CENSORED (see you in court, baby.)

Giving away £6,000 worth of gold and diamonds that have been exquisitely crafted by the winner of The De Beers-Diamond International Award is quite a serious business . . hic . . So we are taking the trouble to restate the rules now, that are clearly set out in every copy of PIMANIA - here goes .. . . ..

Any PIMANIAC who believes that they have solved the Quest, must be present at the right place, at the right time, on the right date. It is in the nature of the Quest that there can only be ONE WINNER. No correspondence please, the PiMan's decision will be final. And by the way, to the loonies going to Bethlehem on Christmas Day, and the person trying to book a flight on the Space Shuttle........don't bother! Please!

NO ONE HAS WON THE GOLDEN SUNDIAL OF PI ....YET!!!

The Golden Sundial of Pi